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JAMES P. PORTER, Editor
Ohio University

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THE INTERCORRELATION OF SOME STANDARDIZED PERSONALITY TESTS

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The testing of personality traits is at present a very active if somewhat immature phase of psychology. Results of current objective personality tests are probably somewhat less accurate than Binet's 1906 intelligence scale. This fact, however, is no excuse for neglect of the field. It is rather a challenge to us to develop better tests and more refined techniques.

The present study represents an attempt to clarify some of the interrelationships of tests which allegedly measure similar or related factors in personality. It was felt that administration of a large number of tests to the same group would give us some dependable knowledge of the extent to which these tests measure the same or similar aspects of personality. We hope in this way to add something to the basic body of facts upon which future investigators may build in the development of newer and better tests.

THE TESTS

In the present investigation six tests of various personality factors were employed.[1] They were administered according to the author's directions for each, but in the scoring of one or two deviations were made which are indicated separately for each test.

[1] I have many acknowledgments to make: To Dr. V. A. C. Henmon, for advice and generous encouragement in this project; to Dr. H. F. Harlow and Mr. J. Pessin, for suggestions; and to my wife for many hours of assistance in the large amount of routine work.

a. The Allport A–S Reaction Study.[2] This test is furnished in two forms, one for men and one for women. The scores for the two are not directly comparable and it was, therefore, necessary to find some score on a common basis for use in correlations. This was devised in the following manner: In the Manual decile ranks are given for scores on each form of the test. We therefore felt that conversion of the scores into decile ranks would permit of their being used in the same correlation. The only question that enters here is that of the comparability of groups, and since Allport's data are based on a considerably larger number of cases we felt that we could safely use his norms in this way. Allport's ranks from –4 to +4 were converted by adding four to a scale of 0–8. A rank of zero is most submissive and of eight, most ascendant. (A few coefficients were computed with the score values, and it was noted that they corresponded to the coefficients from the ranked scores but were uniformly somewhat closer to zero.) It is interesting to note that the published correlations using the Allport test take no note of this different standardization of the two forms.

b. The Laird Personal Inventory, Form C 2.[3] While considerable sex differences are found on this test, the scoring is identical for the two sexes. We therefore used score values throughout for this test.

c. The Neymann-Kohlstedt Diagnostic Test for Extroversion-Introversion.[4] This test, like the Allport, yields both plus and minus scores. For the sake of convenience in handling the scores for both of these tests were increased by forty in order to eliminate negative quantities. To obtain the score mean, forty was then subtracted from the value obtained.

[2] Houghton-Mifflin Co., New York. For theory and description, see Allport (1).

[3] Hamilton Republican, Hamilton, N. Y. A slightly different form is discussed in detail by Hoitsma (10).

[4] C. H. Stoelting Co., Chicago. For standardization and distribution of scores, see Neymann (17).

This method greatly decreases the difficulty of computation and affects no measure reported in our tables except the coefficient of variability, V.

d. The Thurstone Personality Schedule.[5] Sex differences are also an important factor here. There is a reasonable question as to the validity of using scores for members of both sexes in the same correlation under such conditions. The only alternative was to convert the scores into percentile values according to Thurstone's norms for the two sexes and this procedure itself is open to criticism. For the present we have used the raw scores in our correlations.

e. The George Washington University Social Intelligence Test.[6] This test was used throughout as the Manual directs.

f. The Hart Social Attitudes and Interests Test.[7] This is a collection of verbalized concepts about social progress, reforms, problems, etc. The author did not derive a quantitative score for the test, being content with a discussion of the individual items. We therefore selected fifty-two items which Hart found to differentiate the "leaders of social progress" from other individuals. These items were then used as the basis for a numerical score, one point being given for each item marked as the "leaders" marked it. The resulting scores give a normal distribution.

g. General Intelligence. Scores were available for approximately one-third of the group on either the 1927 or 1928 form of the American Council Psychological Examination. To render these comparable they were converted into percentile rankings.

The subjects who served in this study were 175 students of the sophomore, junior and senior classes at Gustavus Adolphus

[5] University of Chicago Press. Thurstone and Thurstone (19) describe derivation and standardization.

[6] Center for Psychological Service, Washington. General information in Hunt (12).

[7] Iowa Child Welfare Research Station, Iowa City. Hart (9) discusses the theory and development of the test.

College. They were at the time enrolled in the author's classes in elementary and educational psychology. A marked degree of interest was shown by the students and a discussion of test scores proved a valuable basis for personal interviews and advice. We believe that when more refined tests are available they will be a better adjunct to the adviser than an intelligence score can ever be.

RESULTS

The intercorrelations are summarized in Table I. For the benefit of others who may use these tests the measures of central tendency and variability are summarized in Table II.

Since the tests were administered in class, the number of cases varies for each correlation, ranging from 59 to 167. As

TABLE I

Summary of intercorrelations

(The number in parentheses gives the number of cases for each correlation)

	A–S	C2	N–K	P.S.	HART	SOC. INT.
Laird C 2	−.255 ±.066 (90)					
Neymann-Kohlstedt	+.357 ±.062 (90)	−.392 ±.044 (167)				
Thurstone P.S.	−.514 ±.057 (75)	+.530 ±.040 (145)	−.340 ±.049 (147)			
Hart Social Att.	+.074 ±.073 (83)	+.200 ±.052 (153)	−.097 ±.053 (153)	−.067 ±.058 (132)		
Social Intelligence	+.126 ±.072 (85)	+.190 ±.051 (160)	−.148 ±.052 (161)	+.080 ±.056 (141)	+.146 ±.055 (148)	
Gen. Intelligence	*	+.187 ±.080 (66)	−.107 ±.084 (63)	−.094 ±.087 (59)	+.074 ±.085 (62)	+.457 ±.067 (62)

* Too few cases on this comparison.

TABLE II

Measures of central tendency and variability

	N	MEAN	MED.	RANGE	S.D.	S.D.av.	V
Allport A–S	94	+3.24	+2.5	–35 +53	19.43	2.004	44.70
Allport Rank Scores	94	3.48	3.0	0–8	2.47	0.254	70.98
Laird C2	175	15.95	16.0	4–32	4.678	0.353	29.32
Neymann-Kohlstedt	172	+2.87	+1.5	–28 +38	13.168	1.004	30.51
Thurstone P.S.	149	51.95	47.0	5–151	28.755	2.355	55.35
Social Attitudes	158	30.15	31.0	12–45	6.771	0.538	22.45
Social Intelligence	166	96.16	97.3	50–138	18.02	1.398	18.66
General Intelligence	68	45.45	40.5	1–99	25.89	3.13	56.87

a result of lack of time the Allport test was administered to only one of the classes.

We may best consider all the correlations for a single test at once. For the Allport test the expected relationships appear with the two measures of introversion. There is a fair tendency for the submissive individual to be also introverted, but it is relatively slight. The most interesting coefficient is a –.514 with the Thurstone neurotic inventory. While it is true that eleven items in the two tests are identical, these are hardly enough to cause such a high correlation. The scatterplot for this correlation looked slightly curvilinear but the corrected Eta was only .544. This difference is not enough to show a true curvilinear relationship. With the Hart test and with Social Intelligence the relationship is insignificant. Too few individuals taking the Allport test had intelligence scores available to make this correlation worth computation. Broom (4) reports a correlation with intelligence of –.012, Bender (3), one of .0008. Jersild (13) reports a coefficient of .26, but his is based on only 42 cases.

The reliability of this test as found by Broom is .718, measured by retest. The reliability announced in the Manual is

.74 for the form for men, .78 on the form for women. These values are definitely too low for any test used as a measure of individual differences.

Some of the correlations reported here have also been computed for other groups. Broom (5) reports a correlation for A–S with the C 2 test of .134. This is in the opposite direction to our finding. With the Thurstone test, Allport (2) obtained a correlation of .347 (the inversion of sign is due to his method). When he eliminated from the Thurstone score the eleven items common to the two tests, the coefficient was lowered to .254. This seems to indicate that our result is unusually high. Our method of computation may be a factor here—Allport's group was composed entirely of men and so he had no question of comparability of scores to settle. Broom (4) reports a correlation with Social Intelligence of −.122, likewise inverted in sign as compared with ours. Jersild (13), on the other hand, agrees with us very closely on this correlation, his coefficient being .14.

The Laird test shows a surprisingly low correlation with the Neymann-Kohlstedt inventory, which is devised to measure the same aspect of personality. (The correlation is negative because a high score on C 2 means introversion, but on the N.K. test, extraversion. This causes the inversion of signs on all their intercorrelations.) If two tests of "introversion" cannot agree better than .40, one is justified in criticizing the personality tests at present available. That this is not peculiar to our subjects or pairs of tests is shown by the work of Hovey (11), who found the following intercorrelations: Laird-Conklin, .27; Laird-Freyd, .42; Conklin-Freyd, .39.

The high correlation of Laird and Thurstone's tests could have been predicted from the large number of items common to both. The last three correlations indicated in the table for this test, with Social Attitudes, Social Intelligence and General Intelligence, are interesting rather for their remarkable consistency than for any other reason. It would seem that introverts are slightly more intelligent and more socially pro-

gressive than extraverts. These are to some extent confirmed by the corresponding correlations for the N.K. test.

The odd-even reliability of the C 2 inventory is reported by Weber and Maijgren (20) as .43 and by Broom (5) as .69. These are considerably lower than the reliability usually quoted for the test, of about .85. Hoitsma (10) reports a reliability of .8 for the C 1 inventory, the immediate predecessor of the C 2 form.

Correlations which may be compared with our own on this test include the following: Landis (15) found a correlation between the Freyd-Heidbreder test and a modification of Thurstone's inventory of .47. This checks closely with our own result. His group included 112 girls, a fact which would tend to lower his correlation somewhat, as it is well known that when consistent sex differences are found on the tests correlated, a heterogeneous group will give a slightly spurious raised correlation. This is the reason for our suggestion that percentile rankings within the sex group be used as the unit for correlation.

On the correlation of C 2 with Social Intelligence, McClatchy (16) reports a coefficient of .53, which is out of all proportion to our result. Since she includes only 27 cases in her correlation, we can assume that this high value was due to chance.

When we come to compare the coefficients from the N.K. test with those on C 2, perfect agreement as to the direction of relationship is found (the inversion of signs due to scoring technique being kept in mind here.) Introverts are more submissive and more neurotic; they have attitudes more favorable to social progress, higher social intelligence and higher general intelligence. In size, however, we find the C 2 coefficients larger, the only exception being the A–S correlation. It is interesting to speculate as to the cause of this. Two explanations suggest themselves: this may mean that the Laird test is a more valid measure of introversion, conceived as a personal factor influencing various types of attitudes and in-

terests, or it may mean that the Laird test is more influenced by some factor common to the other tests. In view of the emphasis we have placed on identical elements in the tests so far, we suspect that the second explanation is more plausible.

The odd-even reliability of this test is given as .83 by Guilford and Braly (8). This is based on only a small number of cases. Neymann (17) reports administering the test to 900 individuals but gives no correlations and no measures of central tendency or variability. From a consideration of the distribution curves of three groups he concludes that extraverts are more intelligent—a conclusion not at all warranted by the evidence. It may be mentioned that his curve for 900 cases is a distinctly bimodal distribution. With our group of 172 cases the curve persistently assumes the normal shape, regardless of the method of plotting. We are at a loss to explain this difference.

The Thurstone neurotic inventory has been found to correlate rather highly with A–S, C 2 and the Neymann-Kohlstedt test. With the remaining variables in our table, its correlations are near zero. This is to be expected and from one point of view even hoped for, since it indicates that the trait "neurotic personality" is relatively independent of certain other factors.

This test has the highest reliability of any reported in this study. Thurstone and Thurstone (19) report a split half correlation of .897 (uncorrected). This would probably give a retest reliability of approximately .94. They report a correlation with intelligence of practically zero.

The Hart Social Attitudes and Interests test had promised interesting information about the attitudes of individuals toward social progress and welfare. It was thought at least probable that extraverts would score higher on such a test than introverts. The correlations with both C 2 and N.K. tests show, however, a positive relationship between introversion and social attitude. There need, of course, be nothing contradictory about this. It may be that extraverts are more con-

cerned about purely personal relations, introverts thinking of man more in an abstract way.

The correlation of Hart-Thurstone is insignificant. With both general and social intelligence we find a positive, but slight, relationship. Since the test as a whole shows little or no utility value we have not calculated reliability coefficients for our method of scoring.

The Social Intelligence test was likewise expected to favor the extraverts somewhat but here again we find introverts scoring somewhat higher. There is, on the other hand, a positive relation between ascendance and social intelligence. The correlation of .457 with general intelligence confirms statements that this test measures abstract intelligence to a considerable extent.

The reliability of this test is given by Hunt (12) as .89 (retest). A correlation of odd and even items, when corrected for attenuation, gave a coefficient of .88. Jersild (13) reports a correlation of .40 with general intelligence, agreeing closely with our own. The close relationship of general and social intelligence is confirmed by Broom (6), Garrett and Kellogg (7) and Strang (18).

COMMENTS

The average of the twenty correlations presented herewith is .221 (disregarding signs), and if we omit the five presented for general intelligence, is .234. Six of these are more than four times their P.E., and two others are practically that much. To these we may attach a certain amount of statistical reliability; to the others, relatively none.

This lack of correlation may be interpreted in two opposite ways. It may mean that we have succeeded in isolating separate and relatively independent aspects of personality, such that they do not correlate with each other except in so far as there are common factors equal to roughly 5 per cent of the elemental factors determining these aspects; or it may indicate that these measures are largely taken at random and

are determined only to a relatively slight extent by true personality traits. The second of these suggestions is supported by what evidence is available. (1) Of the eight reliable correlations, seven are comparisons of tests aiming to measure similar or identical traits. These include the six comparisons of the A–S, C 2 and N.K. tests and the general-social intelligence correlation. The only other coefficient in this group is the C 2-Hart correlation. (2) The size of the coefficient in these eight is more or less related to the number of identical elements in the test questions. The Thurstone schedule, for example, includes certain items from the A–S test and some from the C 2 test. These correlations are very high. They are, indeed, higher than the C 2-N.K. correlation, between two tests supposed to measure the same trait. In general we think we may interpret our intercorrelations as indicating that we have made very little progress in our task of abstracting aspects of the total personality.

There are certain obvious applications of the present facts to the construction of personality tests. (1) The correlations may have been lowered by the unreliability of the tests. The only test used in this study having a reliability of .90 was the Thurstone schedule. When we consider that Kelley (14) sets a minimum reliability of .94 for any test to be used in the study of individual differences, we can easily see that our tests must be made more reliable.

(2) As means of increasing the reliability we suggest the inclusion of more items. Our present tests are much too short. No one would think of attempting to measure intelligence in fifteen minutes, yet that is the length of time required for many of these tests. Four times that period is the minimum for a good intelligence examination. The surprising thing is that investigators instead of developing longer and more reliable forms are evolving "short forms" to administer in five minutes!

(3) Increasing the number of items leads naturally to the question of validity: what items shall be included? We need

a criterion. Ideas often differ as to the meaning of a given term (*e.g.*, introversion, in which we have four or more tests, each based on a different definition). In such cases it would be valuable to investigate the extent to which these tests overlap. It might even be desirable as a temporary expedient to devise an omnibus test. We might reasonably combine the best-standardized tests of introversion into a single inventory which would no doubt yield a much more valid score, even if we were a little less sure just what our definition was. Each item may be validated against the test as a whole.

(4) We should like to suggest that entirely new tests of personality traits be devised and tested. These tests should seek a higher reliability than is common at present; they should validate each item against the whole by the criterion of internal consistency; and if possible they should agree with some external criterion. It is not felt that the last is very important as yet. It is more desirable that definitions be revised and criticized, possibly even consolidated. It is better to have a blanket concept of a trait which is useful than to have a neat, well-isolated definition which is of no practical value.

SUMMARY

1. Intercorrelations, measures of central tendency and variability are presented for six objective personality tests.

2. The correlations are mostly low, and the cases of high relationship are usually those in which the tests contain identical elements.

3. Some suggestions are made as to the possible improvement of personality tests.

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GERMANY'S ELIMINATON TEST FOR DENTISTS

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I. INTRODUCTION

At present all persons seeking to prepare for the dental profession in Germany must take and successfully pass a battery of searching tests. Before proceeding to an account of the tests it will be well to say something regarding the training and status of the dentist in Germany. The dentist is not to be confused with his academic competitor, the *Zahnarzt*. The *Zahnarzt* is fully educated in the academic sense and holds a full medical degree. He is a medical doctor, perhaps also a surgeon, who has specialized in diseases and troubles of the teeth. The dentist on the other hand is a practical though perhaps highly skilled technician. We are speaking here of the *Staatlichgeprueften Dentisten* who form the National Association of Dentists (*Reichsverband Deutscher Dentisten*) with head offices in Berlin. Among others these dentists are permitted to take as patients the large number of people who are insured in the *Krankenkasse*, one of the great social institutions of Germany. Certain classes of people, particularly laborers, are required to pay small fees to the *Krankenkasse* as a premium for medical services to which they are entitled when need arises. This system has been found successful in combating the tendency which is world-wide to neglect ills—naturally one takes advantage of medical services for which one has already paid. The *Reichsverband* of dentists sponsors the series of tests now to be described and has brought about

the requirement that they be taken. The medical doctors of dentistry do not have to take these tests.

The *Zahnarzt* has completed his *Gymnasium* (high school) education before his college medical education begins. The dentist on the other hand can enter upon his seven years of dental training without education in the *Gymnasium*. His seven years of training consist of three years of professional training, largely practical, followed by four years as a practicing dentist, four years of apprenticeship, of a type. Both the dentist and the *Zahnarzt* have to take government examinations after their dental training and before setting up independent practice. The dentist, in addition, has to take the series of tests we are about to describe *before he commences his professional training.*

II. THE TESTS DESCRIBED

These entrance tests are not given by dentists but by psychologists, generally in University Psychological Institutes. The tests were assembled and some of them devised in the *Technische Hochschule von Darmstadt,* an institution of college grade. Professor Dr. Ing. Bramesfeld of this institute is a psychologist who is chiefly responsible for the construction of the series of tests and for supervising their administration. His chief collaborator is Professor Dr. W. Maier, of Karlsruhe.

Corresponding to the needs of the profession both technical and mental capacities are tested by a series of tests divided into six major divisions as follows:

1. Tests of sensory acuity.
2. Tests of manual skill.
3. Tests of general intelligence.
4. Tests of practical intelligence.
5. Tests of form of work (*Arbeitsform*).
6. Determination of educational level.

It takes about six hours to take the entire series of tests, and this time is divided between the forenoon and afternoon of the day of examination. The tests are not given in the

order named above, which is logical and psychological. On the contrary, the tests are given so as to avoid fatigue and other undesirable consequences, the practical and written portions alternating. An interesting feature of the tests not often found in tests devised in the United States is that the examiner systematically notes and reports on the subject's behavior during the test, his poise, his interest, patience, ingenuity, persistence, and many other traits.

I. Sensory acuity is tested by means of four sub-tests as follows:

a. Sensitivity to color and brightness is measured by means of a series of grays and with Stilling's *Pseudo-Isochromatische Tafeln*,[1] a test for color blindness and color sensitivity, a matter of importance to the dentist who is guided by fine differences of color and shade in identifying diseased conditions of the teeth, and in selecting the shades of artificial teeth. The dentists taking the tests at the Rostock Psychological Institute are further given (as a matter of interest merely) a test in which use is made of Wölfflin's plates which measure supersensitiveness to the colors red and green.[2]

b. The sense of touch is tested by means of a series of standardized metal plates, ten in number, which vary in thickness from 0.4 to 2.0 mm. These are placed on a glass surface, and the subject's vision of them excluded by means of an opaque frame. The plates are presented in mixed order, and S (subject) has the task of arranging them in the order of thickness. The test is repeated three times and the time required together with the errors are recorded. Time does not count in scoring and every one-place misplacement of a plate counts as an error of one point. It should be said that tests are nearly always scored by reference to standard tables.

c. The sense for lifted weights is tested as follows: Five empty tin vessels of the same size and form are to be loaded

[1] 15th edition, Leipzig, 1918.

[2] Dr. Ernst Wölfflin, *Tafeln mit Umschlagfarben, zum Nachweis von relativer Rot- und Grunsichtigkeit*, George Thieme, Leipzig, 1926.

with small bits of metal until each one is equal in weight to a standard vessel whose weight is 50 grammes. S. may achieve this in any way he desires (with either or with both hands, etc.). The examiner tests the results with balances and records the errors in grammes. Time again is recorded but does not help determine the score, which depends on the errors interpreted in terms of standard tables.

d. Olfactory sensitivity is measured by use of a series of solutions of the oil of peppermint of varying intensities, corresponding to one, four, nine and sixteen drops of oil in one cubic meter of water. To these four stimuli, in bottles, are added two bottles containing distilled water. The series is presented twice, and the observer's threshold determined.

II. Tests of manual skill. It is unnecessary to enlarge on the rôle played by skillful hands and fingers in the profession of dentistry.

a. The steadiness tester in the form devised by Moede is used.[3] S. using a simple stylus traces simple and complex patterns cut into a metal surface without touching the edges. Scores for the difficult patterns are weighted. The general behavior of S. during this test is recorded.

b. The second test has two parts but each one is a test of manual skill. The first one is a test first devised by Moede. In this test S. is required to construct out of wire, using a suitable pair of pliers, a copy of a model before him.[4] Lately, a thinner wire has come into use, enabling the subject to dispense with the pliers. The model to be reproduced is a form of wire frame with a hook for impaling pieces of paper. There is no time limit and results are scored by comparing S's attainments with five grades of excellence in the form of photographs, just as in the drawing tests in the Binet Series. In the second part of this test, S. is given a bar of plasticine of 500 grammes and a modeling tool, and is required to copy the

[3] W. Moede, *Praktische Psychologie*, 1920–21, 2, pp. 289–328.

[4] B. Hertwig, *Praktische Psychologie*, 1921–22, Vol. 3, pp. 127–140. See diagram on p. 130.

large model of a tooth laid before him, using all of the material given him. Fifteen minutes are allowed and the results are scored with reference to five grades of success which the examiner has at hand in the form of photographs.

III. General Intelligence is tested by means of the four following group tests:—

a. Speed of 'apperception' is measured by a test devised by Moede involving a comparison of designs (*Figuerenvergleich*). A complicated drawing is laid before S. consisting of a right and left portion. The one on the left is regarded as the standard, and the one on the right though corresponding in general to the form of the left figure, still shows as many as 40 'errors.' S. is instructed to mark all points of the figure to the right as quickly as possible that fail to correspond to the figure on the left. The total time allowed is 4 minutes. This test is suited for detecting persons who are hesitating, slow, or inhibited in their decisions.

b. Memory Test. A large chart is presented with 6 complex figures on it in regular order. This chart, 90 by 59 cm. in area, is presented for 4 minutes, including the time necessary for instructions. S. is instructed to note (1) the forms of the figures, (2) the three numbers written below each of them, (3) the positions of the figures on the chart. A prepared chart is then distributed on which figures, numbers and positions are to be reproduced, fifteen minutes being allowed. Memory for figures, numbers and positions are computed separately. The test is very difficult and brings out especially the capacity for grasping form, number, and position.

c. Logical Combinations Test. This is the well-known Ebbinghaus test.

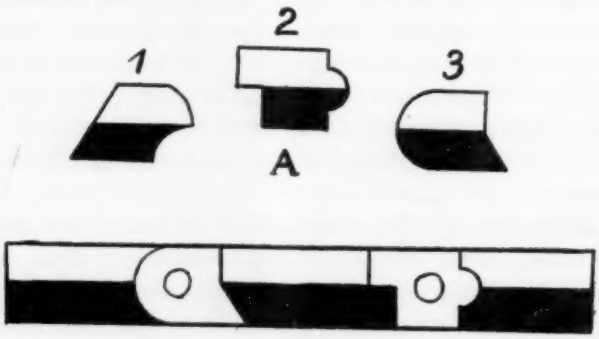
d. Logico-critical Thinking. This is tested by material which among other things contains 'nonsense.' Each S. gets a sheet of printed material containing errors of grammar, punctuation and orthography, and also logical contradictions, some easy and some difficult to detect. The errors of grammar, punctuation and orthography are to be corrected, and the

logical errors are to be underlined or checked, though S. may analyze them further if he likes. The first three types of error are scored in terms of unweighted points, but the logical problems according to weighted scores. The time for the whole test is fifteen minutes.

IV. Tests of Practical Intelligence.

a. The first is a test of visual attention span and of the survey capacities of visual perception. At a distance of one meter from S. hangs a chart with the numbers 10 to 49 inclusive, on it, in 8 rows of 5 numbers each, but in mixed order. S. is given a pointer and is asked to find and point out the numbers in the order from 10 on and as quickly as possible. The time required and the behavior of S. is recorded. Failures seldom occur and when they do, are corrected by the examiner. This test is intended to measure the ability to make a controlled search for the appropriate numbers, free from nervousness and incoordination.

b. Test of accuracy of form comprehension, the *Formenergaenzungs-test* of Friederich.[5] Each S. is given a printed form, the lower part of it showing figures in black and white with blank spaces between them. In each blank space one sees from one to four little circles. In the upper half of the form are to be seen other forms which if correctly selected



[5] A. Friederich, *Praktische Psychol.*, 1922, Vol. 3, pp. 159–166.

will fill in the blank spaces below perfectly. In the accompanying diagram, the lower figures marked B are the ones whose spaces are to be filled in, and the necessary parts for filling in are found amongst the upper figures at A. In the form with which S. works there are 16 spaces to be filled in, and 43 forms are given to fill them with, the number of figures required for each space being indicated by the number of small circles in each space. The problems vary in difficulty and the difficult spaces have weighted scores. The total time permitted is 20 minutes.

c. Simple mirror-drawing test, in which 5 points on a page are to be connected in pencil, using straight lines. There is no time limit, and the score is based on the length of time taken, the quality of the work, S.'s procedure and behavior during the test. The quality of the work is graded by reference to five graded standards.

d. Mechanical Comprehension Test. A machine is provided consisting of a frame provided with four wheels over which a belt runs smoothly when all the parts are in adjustment. The four different wheels stand in different planes, and when the parts are not nicely adjusted the belt springs from the wheels when the driving 'crank' is turned. The subject first sees the apparatus function when it is correctly adjusted. He then turns his back for a moment while E. releases three set screws which result in a collapse of the shafts bearing the wheels. S. is then required to readjust the whole machine. The machine is so constructed that it taxes the ability to understand the mechanical interdependence of parts. Trial and error procedure is not apt to succeed and the behavior of S. shows whether he is depending on 'luck' or not. If S. does not succeed in three minutes, E. says to him, "Think, what is the function of these three set screws?" The time allowed is 7 minutes. The whole attitude of S. to the problem, whether of anxiety, patience, foresight, joy over success, etc., are noted and recorded. Both the time and the 'quality' of the work count in the total score.

V. Form or Manner of Work (*Arbeitsform*). The tests of this section are intended to detect such traits as the system, tempo, cleanness, sense of order, zeal and energy of the subject's manner of working. These qualities, already measured by preceding tests, are further measured as follows:

a. Number Ordering Test. The observer is given a container with 100 small cardboard squares in it bearing the numbers from 1 to 100. S. is instructed to arrange the numbers in the order from 1 to 100 in a suitable pattern which makes an easy survey of all numbers possible so that any number can be found at once. Many arrangements are possible and S. is told to achieve the desired end as practically as possible. There is no time limit and the final result is scored by reference to many printed arrangements which serve as standards. The method of procedure adopted by the subject, the carefulness, the goodness of the final arrangement, and the tempo of work are also judged.

b. Threading Test (Einfädel Test). This is a test requiring high manual skill, steady hands, and good visuo-motor coordination. A small apparatus is provided consisting of a metal handle attached to a disc about one centimeter in diameter. On this disc stand four elastic and thin steel needles pointing away from the handle like the prongs of a fork. The four needles vary in length from 9.5 to 10.5 cm. In addition 15 metal discs are provided all perforated in the same way with seven small holes, four of which fit the four needles. S. is required to thread the fifteen discs on the four needles without using force, the maximum time allowed being 15 minutes. The smallness of the holes and the positions of the needles make the task difficult. If S. has no success after three minutes the examiner asks him to look carefully at the discs and then at the needles upon which they are to be 'threaded.' The score depends on the number of discs threaded. The behavior traits during work are again noted, system, patience, and so on.

VI. Grade of Education with Special Reference to the Use of Language. Part VI consists of no special tests. S. is required to write an autobiography in 20 minutes. His orthography, his clearness and style of expression are noted and judged.

Final Evaluation of the Tests. To arrive at a comprehensive picture of the total results a rough survey is made in which all tests are graded on the basis of five, with four subdivisions for each unit, giving a scale of 0 to 20, in which unit 3 is average. The results of the tests are then shown graphically as in the familiar 'profile' method, so that those who are but practically interested can see at a glance the standing of the subject. This is followed by a detailed psychological statement written by the examiner on the major capacities tested, in which the subject's good and bad points are discussed. If the subject is weak in but few tests, definite rules exist for compensating for these by good success in other tests. But certain essential tests cannot be so compensated. The chief purpose of the examiner's statement centers on the question, is the subject qualified or unqualified for undertaking the training for the dental profession? Those who fail to qualify can, under specified conditions, repeat the examination after six months.

How has the introduction of these tests been justified? Two criteria may be applied, as follows: (i) the comparison of the test results with the practical capacity of the subject tested as determined by his professional success; (ii) comparison of test results with the ratings of professors of dentistry under whom the student gets his instruction. As regards the first of these methods there still exist certain difficulties. The chief defect is the want of groups large enough to yield objective and uniform standards. The test has been in use but several years. On that account the subjects tested have not as yet arrived at their characteristic level of capacity. Not until a large number of earlier testees can be reassembled in a dental institute to have their capacities tested and com-

pared will an evaluation of the test be possible. Professor Bramesfeld is assembling material on this point and hopes to begin such a statistical comparison in about one year.

The members of the dental profession bound together in the national association look upon these tests with favor. At a meeting held in Frankfurt in 1932, which considered experiences with the tests throughout Germany, general approval of the tests was shown.

In the regions where Professor Bramesfeld has fairly exact oversight, about 10 per cent of the candidates on the average fail to pass the tests, though the failures at some places are as high as 30 per cent.

Further, as regards our second criterion, there is generally good agreement between test results and professors' ratings of dental students. It has never occurred that a candidate who was found 'suitable' in the test was afterwards found unsuitable in college work, except in one case in which, however, a psychosis was involved.

A STUDY OF STUDENTS' KNOWLEDGE IN THE USE OF THE LIBRARY

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REVIEW OF LITERATURE

Upon reviewing the literature on the library and its function in education one is impressed with the number of things written, but at the same time one is made fully aware of the paucity of actual experimental literature to be found on this subject. Just why in this age of investigation the library has been left out is hard to say. Perhaps books are formidable things to most people and the library being a depository for books has made the investigator a bit wary of attack. After reviewing briefly a few pertinent points, both factual and conjectural, regarding the library and its use the writers will offer a *preliminary study of the knowledge of the use of the library as found by administering an information quiz* to 441 university students at Ohio University.

Lillian R. Leonard (8) in a recent English Journal says, "A few years ago at a National Convention of librarians held in Seattle two distinct views of the nature of the library were set forth. One group regarded the library as a store-house of facts; the other thought it a treasure chest for safeguarding the choice gems of the ages. It really makes little difference which view is held and even less difference which view is right.

* The writers wish to express their appreciation to different Faculty members, to the Librarian, and to subjects for cooperation in making this study.

In either case the young student must be taught how to avail himself of its contents'' (p. 240). The writer of this article then proceeds to show that the use of the library should be taught to high school pupils by the English departments. She outlines a plan whereby the English teacher may lead the student into the world of books, periodicals, etc., which are found in libraries both institutional and public.

Margaret R. Greer (7) is convinced that courses in the use of the library should become a part of the curriculum and credit be given for them. Certainly all prospective teachers should be acquainted with the card catalog and reference sources like the Readers' Guide, etc.

Eleanor F. Lewis (9) in a paper, ''A College Librarian Talks to Students,'' hits at the *lack of conscious effort* directed toward the library on the part of all concerned with the university life, when she says the students are giving Psychological Entrance Tests, they are introduced to Freshman Week, to Lectures by various deans, to Smokers, Mixers, etc., but the Library is an unknown quantity.

Hilah Paulmier (10) after reviewing the place of the library in ancient Egyptian, Greek, and Roman learning, enters into a discussion of the part played by the library in the ''Revival of Learning.'' The author takes a fling at present-day old world inefficiency in cataloguing while in this country the cataloguing systems, shelving, spacing, etc., are becoming scientific. The question might be raised ''does not the scientific housing of books make it impelling that knowledge in finding and using books be given?'' If the library is opened to not only the scholars as in days of yore but also to the public, then in order for it to function in a vital way certainly laymen must be taught how to use it effectively; especially is this true where professional and business people are concerned. People do demand figures well in hand before they talk; although often the figures and facts quoted are out of date. Certainly if vicious information is not to be disseminated, the facts and figures presented must come from the latest bulletins and

reports and this usually necessitates library references. Time otherwise spent in search of necessary materials should be given to careful reading and assimilation of the material to be presented.

L. L. Dickerson (4) in a discussion on "Individualizing Library Service" for adult readers pleads for "Advisory Service" to readers in public libraries. Then adult education will have a tendency to be organized around people's interest.

Gertrude Buck (2) after discussing the "Essentials in Library Instruction" ends her article by saying, "In a very real sense, the key to scientific pedagogy of the future lies in the group of studies summed up as library science, for the library is the late and complex object which sums up in itself the sciences of the book, the word, all elements of expression and record, and reading is the 'tool par excellence to hew down the tree of ignorance'" (p. 271). This is a plea for library training for teachers.

Humphrey Gambier-Bonsfield (6) says, "Statistics show that more people are using libraries now than ever before" (p. 93). Professional people comprise the largest per cent but trades- and business-people are also using libraries as never before. Students wanting to read for pleasure, for information or for both, do not know where to find material if one is to judge from the vague questions asked of reference librarians. A knowledge of the catalog is essential if one is to gain entrance into the storehouse of the wealth of literature extant today.

Dr. Arthur E. Bostwick (1) in a recent article on "The Library and Scholarship" discussed advisory library service in public libraries. He pleads for texts written for mature adult minds; texts which are complete without the need of an instructor. The need would, if met, require a knowledge of use of libraries other than those of universities.

Hazel Webster Byrnes (3) in supporting the newer viewpoint of *individualized education* as over against *education en masse* pleads for "Student Centered College Libraries."

This author quotes a statement from Philip Wylie in the *Saturday Evening Post* to the effect that "students have failed because his thinking depended upon what the teacher wanted him to think." This author would create a book reading student body: "Self Education" if you please. We might add while a reading public may not necessarily be a thinking public, certainly, it is more likely to be one.

The President of the University of California, Dr. Sproul (11), recently said to a group of librarians: "A librarian should be more than a keeper of books. He should be an educator. The vitalness of the library to all departments of the university can not be over-estimated. King Osymandye of Egypt, the founder of the first library, called it 'The Medicine House of the Soul.' "

L. R. Wilson (12) says, "The next decade will witness a distinctive rise in the education level of the South, and I will go further and say that the agency which will contribute to this rise as much as any other will be the library in its various forms."

Jennie M. Flexner (5) in the *Journal of Adult Education* has described an experiment on the "Readers' Adviser" now in progress in the New York Public Library. This writer claims the following two functions of the library in adult education: (1) "The work with the individual who wishes to follow systematic reading for his own benefit; (2) and work with groups or group leaders seeking to accomplish somewhat similar results by extending the reach of the library guidance far beyond the contact with the individual" (p. 76).

There was opened in the New York Public Library a "Readers' Adviser" office in March, 1929. The purpose of this office is to aid users of the libraries in following up in a systematic way the things that appeal to them in their reading. In this way it is hoped that readers will get information organized about certain topics which are vital to them. While this experiment is yet too young to draw generalizations about its value there are records being kept regarding the nature

of the needs, desires, and frequency of returns of visitors and at some future time these records may prove fruitful in determining just what the adult readers' habits are where public libraries are concerned.

The Wilson Bulletin No. 20, April, 1929, reports "A vocabulary test" which is a part of the written examination for teacher-librarians in the high schools in New York City. This vocabulary test, along with the records being kept in the New York Public Library, are about the only things that the authors of this report are able to point toward as experimental investigations with reference to the library and its use.

From the above excerpts one may see the trends of thinking toward the use of the library. Some are pleading for institutional libraries to function for the student; others for aid to the adult reader in the use of the public library. Most of the writers agree that the use of the library is increasing both within and without the schools. But no one has stopped to examine empirically just how much knowledge people have about using the library without the aid of the librarians and their staffs. Of course, if all libraries are manned with a personnel adequate to serve the visitors all well and good, but it is the guess of the writers that this is not true. Then it seems to us that a working knowledge of the use of the library, especially is this true for college students, is necessary if the library is to be as vital in education as it is claimed to be. The only way to find out just how much facility the student has in using the library is to tap for it; with this in mind the authors offer the following preliminary investigation for what it is worth.

EXPERIMENTAL SECTION

The Library Information Quiz in this study is a preliminary form consisting of seventy items, selected largely from some 200 suggested by different members of the University faculty. Items 1 to 9 are of the multiple choice type and deal with general information regarding the library, *e.g.*,

"The catalogue card *always* contains (1. the page size; 2. the author's name; 3. the table of contents). The next ten items are prefaced by directions to check each of the questions that could invariably be answered from the card catalogue. Sample questions are: "Where does the author live?"; "Who published this book?" Items 20 to 27 list eight of the ten major Dewey decimal system divisions and requires the subject to place the proper class number in front of each one.

The next group of items is a list of ten subjects, *e.g.*, modern poetry, attention, etc., and six periodical indexes. The best source of bibliography for each subject is to be selected from the six indexes listed. The following eleven items form a second matching task, with directions to pick the subject covered by each of eleven reference works cited only by short title.

The remaining twenty-two questions are multiple choice type each one giving a subject suitable for a term paper and three choices of reference works from which the most logical is to be selected. Two examples will illustrate the nature of these items.

"Cost of public education (1. Industrial Arts Index; 2. Wall Street Journal; 3. Biennial Survey of Education.)"

"Latest statistics on production in the United States. (1. Readers' Guide; 2. Statistical abstract of the United States; 3. Oxford Dictionary.)"

While the Library Information Quiz is not yet standardized, steps in that direction have been taken. Some of the items selected pertain to lists of topics assigned in course work by different members of the faculty. (Each faculty member was asked to give the most logical references to his list of topics.) The librarian also gave us a list of items taught students in the few lectures given Freshmen on the use of the library. The writers used their judgments also in determining the most logical answer to many of the items. Some expert opinion then formed the basis of the selecting and scoring the items; that is, items were selected, the knowledge of which

seems necessary for any student to have at least the beginning of a working knowledge in the use of the library. Of course, many more criteria will have to be applied before the validity of the quiz can be definitely determined.

The quiz has a fairly high internal reliability. By correlating odd *versus* even scores a reliability coefficient of $.92 \pm .007$ was obtained. As yet the internal reliability has not been worked out by the re-test method. We have some reasons to believe that the Library Information Quiz measures consistently to a degree at least that which it does measure; further work will be necessary before we can say definitely it measures that which it is intended to measure.

This quiz was given to 441 students, men and women representing the four academic classes, during a regular class hour in the second semester of the academic year 1930–31. Judging from the median point-hour ratio and from the centile rank of students, as well as the coefficient of correlation (.46) between point-hour ratio and centile rank on O. S. U. test, it seems that the cases are fairly representative of the University enrollment. The size of each sex-class group is shown in Table 1.

RESULTS

It seems a reasonable hypothesis that during each of the four years of college students should become better acquainted with the library and acquire facility in its use. The data presented in Table 1, however, do not support this hypothesis. Although the σ differences have not been published they have been calculated and in no case is the difference between classes significantly greater than its standard deviation. Comparison of the scores for men and women, as shown in Table 1, again indicates a lack of reliable differences in performance.

Product-moment correlations between the scores on this Quiz and entrance examination centile rank as well as the correlations between the scores and point-hour ratios are shown in Table 2. In the calculations the total group of 346 men and women has been used.

TABLE 1

Average Scores on Quiz

YEAR	CASES	MEN AVERAGE		CASES	WOMEN AVERAGE	
Freshman	91	41.22	5.64	64	42.07	5.08
Sophomore	80	40.76	4.61	45	42.60	5.31
Junior	51	41.82	5.62	31	43.32	5.06
Senior	43	43.58	7.17	36	43.58	7.56

TABLE 2

Correlations

(*346 cases*)

r_{12}	Score *vs.* centile	$.42 \pm .030$
r_{13}	Score *vs.* P.H.R.	$.37 \pm .031$
r_{23}	P.H.R. *vs.* centile	$.37 \pm .031$
$r_{12.3}$		$.30 \pm .032$
$r_{13.2}$		$.21 \pm .034$
$r_{23.1}$		$.36 \pm .031$

The coefficients, while positive, are all low. Inasmuch as r_{13} is less than r_{12} we are led to believe that the individual's knowledge in the use of the library is more closely related to his general ability as measured by the Ohio State Entrance Examination than to his academic rank. Incidentally, the point-hour ratio *versus* centile coefficient, while low, is just about what other studies reveal with our students here. The partial correlation technique was applied to see if further light might be thrown on these relationships. About the only thing that can be said is that all correlations dropped. However, the same relative ratios remained. It may be that knowledge in the use of the library is a positive factor or has positive factors in common with intelligence—hence when partialled out ($r_{23.1}$) it tends to lower the relationship between centile rank and academic achievement. Perhaps the more intelligent students have, in the course of their experience, achieved a certain degree of knowledge concerning the use of libraries, but this knowledge plays little part in their academic grade.

DISCUSSION AND SUMMARY

A summary of the literature on the library and its use indicates that many people are thinking and writing about libraries, both institutional and public, but that little in the way of experimentation has been done.

The authors are fully aware that the *Library Information Quiz* used in this study is a pioneer and lacks the advantages of adequate standardization. However, the results here reported evidence the desirability of such a test and suggest its probable usefulness. The insignificant increases in average Quiz score found as we go from the Freshman to the Senior class would suggest that a knowledge of the use of the library plays a rather small part in these students' scholastic achievement. The low correlation between Quiz score and point-hour ratio, which falls to .21 when entrance examination centile rank is kept constant, would seem further to support this statement. It would appear that knowledge in the use of libraries is more closely related to students' general ability, as measured by O. S. U. test, than to educational achievement as measured by point-hour ratio. If these findings are checked with a more adequate test in several universities it would point to the need of an adequate and searching study of the place of the library in the undergraduate's life. Further investigations along this line are now being planned.

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THE MECHANICAL APTITUDES OF 312 PRISONERS[1]

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During a recent occupational survey at the Illinois State Penitentiary, the Stenquist Mechanical Aptitude Test (Form 1) was used. This test consists of a printed form for testing the mental factor of mechanical aptitude. The form contains a series of pictures of common mechanical objects. The subject is required to determine which one of five pictures is related to each of five others. This test is sometimes called Stenquist's "picture" test or "paper" test. Several facts were collected which should prove of interest to those engaged in vocational guidance. This article is concerned mainly with an evaluation of the Stenquist Test in the light of the actual mechanical experience of men revealed through an occupational inventory.

Those who are charged with the responsibility of assigning various tasks to prisoners in prison need some practical objective method for aiding them in the proper placement of these individuals. The records show that the majority of prisoners have failed to adjust properly in the social and industrial world outside of prison. Hence, it is even more important that these men should be placed at a type of work which is in harmony with their aptitudes, experience, and ability.

It is assumed that a man who is properly placed on a job which is in harmony with his intellectual capacity and special

[1] This study was made for the Division of the Criminologist of the Department of Public Welfare of the State of Illinois. Special gratitude should be expressed to Dr. Andrew W. Brown and to Dr. Luton Ackerson for encouragement and advice.

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aptitude will be more tractable than one whose pride, interest, and happiness are injured by being forced to endure a task at variance with his ability and personality. At the present time prisoners are assigned to tasks in accordance with a program of convenience. The authorities who make the assignments are as a rule conscientious in their duties. Because of a lack of a definite technique for placement as well as by the lack of variety in the kinds of work available, they are greatly handicapped. The stone quarry seems frequently the only way out. The chief value of objective tests in prison at the present time probably resides in the suggestive influence they exert in calling attention to the urgent need for greater variety in prison work-outlets. These needs become more evident when the actual aptitudes of the prisoners are compared with the available work-outlets in prison. New shops may be designed to harmonize with the desires and aptitudes of the men.

The men in this study were all given the Army Alpha Intelligence Test and the Stenquist Mechanical Aptitude Test (Form 1) within one month after entering the Illinois State Penitentiary. They ranged in age from 16 to 64 years. There were only a few cases under 21 years of age. The coefficient of correlation between scores on the Army Alpha examination and scores on the Mechanical Aptitude Test was $.46 \pm .03$.

The median and mean scores for the various age groups are presented in Table I. The age standards are of value to those

TABLE I
Median and Mean Scores
(Stenquist Mechanical Aptitude Test)

AGE	NUMBER OF CASES	MEDIAN	MEAN	PROBABLE ERROR OF THE MEAN
15–19	29	66.2	62.4	5.16
20–24	87	61.1	57.3	2.83
25–29	86	62.5	58.2	2.02
30–34	45	60.4	56.5	3.19
35–39	33	57.1	52.9	3.65
40–up	32	50.3	50.5	4.26

who wish to apply the test to adults. Most of the studies made with this test have dealt with boys. Few median and mean group standards have been published for men.

In 1925 Jessup published the following median scores in a study of the mechanical ability of 138 delinquent boys using the Stenquist Mechanical Assembly Test (T–Scores). This study was made in the Juvenile Court in Los Angeles.

AGE	NO. CASES	MEDIAN
12	15	55.0
13	28	50.0
14	42	60.8
15	43	63.1
16 & 17	10	67.5

These figures dovetail into Table I very nicely since the median score for the prison group between the ages of 15 and 19 was 66.2. Jessup's age standards show that the median scores on the Stenquist Mechanical Assembly Test are highest around the ages of 16 and 17. Table I shows that the median scores on the Stenquist Mechanical Aptitude Test are highest between the ages of 15 and 20.

The average Alpha score for the 312 men in this study was 69.0. If this average score of 69.0 is converted into percentiles of the general adult population by means of the table of standards prepared by Bregman for the Psychological Corporation, it is found that 57 per cent of the adult population of the United States may be expected to make a score below that made by this group of prisoners.

At the outset it became evident that there was some relationship between the kind of work a man had done and the score he made on the Mechanical Aptitude Test. Those who made high scores on the test had followed mechanical pursuits. Those who made low scores on the test tended to follow non-mechanical occupations. This fact was established by taking the group of 78 individuals in the upper quartile who made high grades on the mechanical aptitude test and com-

paring them with the group of 78 individuals in the lower quartile who made low test grades.

By means of an Occupational Inventory[2] of each individual in both the superior and inferior groups it was possible to ascertain whether or not the first job, last job, longest job, or father's occupation had been of a mechanical nature. The Occupational Inventory consisted in part of a list of 219 basic occupations. Each individual was required to go through this list and check the kinds of work he had actually done. The list was read to those who could not read. Four judges decided whether or not each job was of a mechanical nature. The term "mechanical" was applied to those occupations in which the men were thrown into contact with things or processes which involved the use of tools or the operation of machinery. Baker and Crockett state in their manual of directions for the Detroit Mechanical Aptitude Examinations that "mechanical aptitude may be expressed as the 'knack' that a person shows for understanding mechanical relationships and handling mechanical things."

TABLE II

Comparison of Upper and Lower Quartiles of Men in Amount of Contact with Mechanical Occupations

	LONGEST JOB		FATHER'S OCCUP.		LAST JOB		FIRST JOB	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Upper Quartile of Scores on Mechanical Aptitude Test (78 Men)	41	53	35	45	40	51	22	28
Lower Quartile of Scores on Mechanical Aptitude Test (78 Men)	11	14	17	22	13	17	8	10

[2] Occupational Inventory, R. M. Simpson (1931). C. H. Stoelting Co., Chicago, Illinois.

Table II shows that men in the upper quartile who made high scores on the Stenquist Test had a greater percentage of contacts with mechanical things and processes through their first job, last job, longest job, or father's occupation than those in the lower quartile.

For example, 53 per cent of the men having Stenquist scores in the upper quartile had held their *longest job* (an average of 54.1 months) at some mechanical trade or occupation; while only 14 per cent of the men having scores in the lower quartile had held their *longest job* (an average of 51.3 months) in some mechanical pursuit. It was found that 28 per cent of the men in the upper quartile had spent an average of 19.3 months at some mechanical occupation on their *first job;* while only 10 per cent of the lower quartile of men had spent an average of 14.3 months at some mechanical occupation on their *first job.* This evidence indicates that the majority of those who made high scores on the Stenquist Test had actually worked longer at mechanical trades or occupations than those who made low scores.

The number of contacts which this group of men had with mechanical trades or occupations is shown in Table III.

TABLE III

Number of Men in Upper and Lower Quartiles Having Contacts with Mechanical Trades through First Job, Last Job, Longest Job or Father's Occupation

	NO CONTACT	ONE CONTACT	TWO CONTACTS	THREE CONTACTS	FOUR CONTACTS
Upper Quartile of Scores on Mechanical Aptitude Test (78 Men)	10	20	29	14	5
Lower Quartile of Scores on Mechanical Aptitude Test (78 Men)	49	15	8	6	0

The superior group of men who made high scores on the Stenquist Test had almost three times as many contacts with mechanical processes as the inferior group. The upper quartile had 140 contacts while the lower quartile had only 49 contacts. Column 1 of Table III shows that 49 of the 78 men who made low scores on the Stenquist Test had had no contact with mechanical occupations through their first job, longest job, last job, or father's occupation. On the other hand, only 10 men in the superior group of 78 men who made high scores on the Stenquist Test had failed to come into contact with mechanical trades through any of the aforementioned channels.

It is evident that these men might have come into contact with mechanical trades through other channels than their first job, last job, longest job or father's occupation. Since the Occupational Inventory gave a list of every kind of work that each individual had done during his lifetime, it was an easy matter to survey the occupational history of each man and record the points of contact with mechanical trades.

The Occupational Inventory brought out the significant fact that every one of the ten men in column 1 of Table III, who had had no contact with mechanical trades through the four channels previously mentioned, had actually worked at some mechanical trade. A survey of all the jobs ever held by the 49 men in the inferior group (column 1 of Table III), who had no contact with mechanical pursuits through the aforementioned four channels, showed that only 9 of the 45 had actually worked at other mechanical trades.

In short, all of the superior group on the mechanical aptitude test had had substantial contact with mechanical pursuits, while only 48 per cent of the inferior group on the mechanical aptitude test had had a meager contact with mechanical trades.

Fifty-eight per cent of those in the upper quartile who made high scores on the mechanical test stated that they preferred work of a mechanical nature. Only 24 per cent in the

lower quartile who made low scores on the mechanical aptitude test chose to follow mechanical types of work.

There has been much speculation as to the ultimate nature of mechanical ability. Some claim that mechanical ability is a unique trait while others maintain that it is more general in nature. Stenquist held that mechanical ability was a unique trait (1921).[3] Baker and Crockett state in their Manual of Instructions that "native differences in mechanical aptitude are relatively fixed as are differences in general intelligence."

The authors of the "Minnesota Mechanical Ability Tests"[4] start out with the assumption that mechanical ability is a unique trait. They state (p. 301) that "three measures of ability utilized in this research—mechanical ability, motor ability, and intelligence—fulfill reasonably well the requirements of unique traits." However, on another page they state that the "theory of quasi-general factors is upheld" by this study. This is rather confusing.

Their argument that mechanical ability is a unique trait is based mainly upon (1) the low correlation found between the scores made on their mechanical ability tests and intelligence as measured by the Otis Intelligence Test; (2) the low correlations discovered between environmental factors and the scores made on their measure of mechanical ability; and (3) the high correlation found between the scores on the test and the quality of work done in the shop courses in school. The results secured by this method are rather clear-cut but are not entirely convincing in view of the results presented in this article.

The results found in the present study of prisoners suggest that mechanical ability is not a unique trait. This statement is based upon (1) the marked correlation found between the

[3] Stenquist, J. L., "The Case for the Low I. Q.," Journal of Educational Research, Vol. 4, No. 4, Nov. 1921.

[4] Paterson, Elliott, Anderson, Toops and Heidbreder, "Minnesota Mechanical Ability Tests," University of Minnesota Press, 1930.

Stenquist Mechanical Aptitude Test and intelligence as measured by the Army Alpha Examination; (2) the substantial correlation shown to exist between actual contacts with mechanical trades and scores made on the Stenquist Test; and (3) the significant relationship found between success on the longest mechanical job ever held and scores made on the Stenquist Test. It is assumed that men whose longest jobs have been held in mechanical pursuits possess the mechanical aptitude necessary to succeed in mechanical lines of work.

If mechanical ability is a unique trait which is more or less native it seems strange that so few boys follow the occupations of their fathers. In a recent survey made of 272 men applying for positions in Chicago, it was found by the author that 77.4 per cent preferred work which differed from the occupation of their fathers. Only 18.5 per cent of a group of 347 prisoners preferred to follow the occupation of their fathers. The occupation of the father evidently has very little influence upon the occupation selected by the son. The correlation between ability on the Minnesota apparatus test battery and the father's occupation, as rated upon a mechanical ability scale, was found to be –.12 by the Minnesota group (p. 265).

The Minnesota group of investigators, working with 100 seventh- and eighth-grade boys, found that "the only measure (among environmental factors) which showed definite and consistent relations with mechanical ability was a measure of the number of mechanical operations the subject himself performed; and this simply means that the possession of, and the exercise of, mechanical ability tend to occur together" (p. 267). If it is true that the "possession of" and the "exercise of" mechanical ability tend to go together, it seems evident that the Stenquist Mechanical Aptitude Test is a good measuring device, since it was found that those who made high scores on the test had been working mainly at mechanical pursuits, while the majority of those who made low scores on the test had not been employed at mechanical trades.

It is significant that the Minnesota group found a correlation of .46 between the Stenquist Picture Test and the Minne-

sota Assembly Test. However, they found a correlation of only .29 between the Stenquist Picture Test and a combined shop criterion based upon the quantity and quality of work done in the sheet metal shop, printing shop, woodworking shop, electrical shop, and mechanical drawing class. Stenquist obtained validity coefficients varying from .51 to .83 with several small groups of boys in the seventh- and eighth-grades. The Minnesota group stressed the quality of work done in shop courses as the best criterion of mechanical ability. They found that the quality of work done in the classroom was only very slightly affected by the past mechanical experiences of the boys. The fact of the matter is that boys of this age generally have had very little systematic training in mechanical pursuits. It is possible that "the quality of work done" at this age may reflect mainly the quality of the eye-hand co-ordination which has been established by growth. Skill may be dependent to a great extent upon systematic practice. The Minnesota group measured past mechanical experience by means of a questionnaire which listed 410 mechanical operations such as repairing roller skates, putting up a shed, splicing a wire, making a bookcase, tightening a coaster-brake on a bicycle, etc. They found a correlation of −.04 between the mechanical information possessed by the boys and the number of things of a mechanical nature which the boys had actually done. This is opposed to the well-founded educational belief that one learns by doing.

The quality of work done is not the only criterion of mechanical aptitude. Certain temperamental factors as well as intelligence must also be considered. The longest job would seem to possess some merit as a significant cue to the combined factors in a man which are necessary to success in mechanical pursuits.

When some investigators find a low correlation between a test of intelligence and a test of mechanical ability they conclude that they are measuring unique traits. Perhaps it would be more in keeping with actual fact to stress the unique tests themselves rather than the unique traits. It is a com-

paratively simple matter to devise two tests which are mutually exclusive in content. For example, a test of arithmetic and a test of Greek may be mutually exclusive in content yet both be tests of general intelligence. Mechanical ability may involve intelligence while intelligence may not necessarily involve mechanical ability. This depends upon how these terms are defined.

In this study it was found that intelligent men were superior to unintelligent men in the scores made on the Stenquist Mechanical Aptitude Test. Seventy per cent of the lower quartile had a mental age below 11 years, 2 months (IQ of 70); while all of the upper quartile were of average intelligence or better. The explanation will probably be advanced at once that the mechanical test was measuring mechanical information rather than mechanical ability. The Minnesota group found a correlation of .35 between scores on the Stenquist Picture Test and a shop operations information criterion. They secured a correlation of .32 between scores on the Stenquist Picture Test and interest in mechanical things and processes. Evidently this test is not measuring mechanical information alone or mere interest in mechanical things to any marked extent since we have such low correlation in the foregoing comparisons. By means of a questionnaire they secured a record of mechanical information possessed by 100 seventh- and eighth-grade boys. The correlation between mechanical information derived by this questionnaire and intelligence as measured by the Otis test was .65. It is evident here that the intelligence test involved mechanical information to a marked degree (as one would estimate from a correlation of .65).

The present study suggests that intelligence is essential for success in mechanical trades. The median Alpha score for the upper quartile of men who made high scores on the mechanical aptitude test was 87.0, while the median Army Alpha intelligence score for the lower quartile of men who made low scores on the mechanical aptitude tests was 35.9. Furthermore, the longest jobs of those making highest scores in the

mechanical test was of a mechanical nature in 53 per cent of the cases as has already been shown.

The correlation between mechanical aptitude as measured by the Stenquist Mechanical Aptitude Test and intelligence as measured by the Army Alpha Test was .46 ± .03 for the prison group of 312 men, while the correlation between mechanical aptitude and intelligence (Stenquist Mechanical Aptitude Test and the Otis Intelligence Test) for 100 seventh- and eighth-grade boys in Minnesota was only .11.

What is responsible for this difference in correlation (age, intelligence or mechanical experience)? To aid in finding the answer to this question a partial correlation was computed with the factor of age kept constant. The following results were secured: the correlation of age with scores on the mechanical aptitude test was – .11 ± .04. The correlation of age with scores on the Army Alpha test was also – .11 ± .04. The correlation between mechanical aptitude and intelligence as noted above was .46 ± .03. The correlation between mechanical aptitude and intelligence, with the factor of age partialed out, was .45. It seems evident, therefore, that intelligence and mechanical aptitude bear a substantial relationship to each other.

Both the prison group of men (whose intelligence exceeded 57 per cent of the adult population, according to Bregman's norms) and the Minnesota group of 100 boys (with an average IQ of 101) had a mean intelligence score slightly above average. Since the Otis test used by the Minnesota group and the Army test used in this prison study are very similar in content and are usually found to be closely correlated, one would expect substantially the same results for the two studies. However, this was not found to be the case as has been shown by the marked divergence in correlation between intelligence tests and the criteria of mechanical aptitude in the two studies.

Since the older prison men in the study and the younger high school boys in the Minnesota study were both of practically the same level of intelligence, and since both achieved

about the same mean test performance on the Stenquist examination, and since the partialing out of the age factor had only a negligible effect on the relationship between intelligence and mechanical aptitude, it seems reasonable to conclude that the discrepancy noted in the comparisons made between the men and boys is due mainly to the greater mechanical experience of the adult group. It is uncertain whether general experience alone would improve the score on the Stenquist test since the mean test scores for the young and the old were about the same, but it appears certain in this study that experience gained through mechanical trades does improve one's mechanical ability as measured by the Stenquist Mechanical Aptitude Test.

Problems within the field of vocational guidance are very difficult to solve. It is hoped that this study may be of some practical help to those engaged in the placement of men in suitable positions. An effort has been made in this study to interpret the scores made on the Stenquist Mechanical Aptitude Test in the light of the reported actual working experience of 312 men.

In conclusion:

1. High scores and low scores on the Stenquist Mechanical Aptitude Test (Form 1) when used with men appear to be significant indicators of the presence of, or the absence of, mechanical aptitude.

2. This study suggests that intelligence is related to success in mechanical pursuits.

3. Occupational surveys of the various kinds of work men have done give suggestive information about mechanical aptitudes.

4. The Stenquist Mechanical Aptitude Test used in conjunction with an occupational inventory and an intelligence test provides a simple and useful device for ascertaining mechanical aptitude in adults.

5. Experience gained through mechanical trades is related to mechanical ability as measured by the Stenquist Mechanical Aptitude Test.

OCCUPATIONS FOR THE MENTALLY HANDICAPPED

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The obligation resting upon our public school system to prepare its graduates for vocational efficiency is now quite generally acknowledged among educational thinkers. The emphasis to be laid on vocational training, however, varies considerably with the type of pupils and the character of the community to be served. The responsibility is, perhaps, particularly pressing in the case of pupils handicapped by grave physical or mental disabilities. To a much greater extent than is true of the teacher of normal pupils, the teacher of the handicapped must bear ever in the forefront of her thinking the urgent need of preparing her charges for some sort of gainful employment in which they can take their place as self-supporting members of the community.

Nevertheless, few of the public schools provided even for the crippled, the deaf, and the blind, could be termed vocational schools in any strict sense of the word. Much less is this true of the class designated "ungraded" or "atypical" and intended for children whose disability consists not in any specific physical defect but in generally low mentality. With the exception of a very few "centers" in certain of our largest and most progressive city school systems, the work in these special classes has little, if any, more to offer in the way of systematic training for specific types of occupation than have the classes for normal children. The explanation lies partly in the difficulty in equipping and financing a program of vocational education at these levels, partly in the general ignorance and lack of agreement as to the types of occupation for which training is needed and feasible.

Under present conditions such vocational training as is afforded these groups at all must be given for the most part incidentally by the regular special-class teachers of general subjects. These long-suffering individuals find themselves called upon to attempt to fit their pupils for kinds of work of which they, the teachers, have no direct knowledge. Indeed they have often but hazy notions as to what occupations their pupils are most likely to enter.

As a first step toward the improvement of this situation it is evident that much more adequate data are needed as to:

1. What types of employment are most likely to be open to boys or girls graduating from public school classes for children of borderline or moron mentality?
2. What training is it desirable and practicable to offer by way of preparation for these occupations under public school conditions?

One approach to the first problem would clearly be to ascertain as exactly as possible the kinds of work in which persons of this mentality are known to have engaged, together with some idea of the proportional frequency of each. To be sure the fact of a position having been obtained is no guarantee that the holder succeeded in performing the duties to the satisfaction of his employers; nor can the circumstance that no individuals are known to have engaged in a given line of work be taken as proof that they could not have done so successfully, given the opportunity and perhaps certain training for the same. Nevertheless, the fact that considerable numbers of the young people in question have succeeded in securing one kind of job and holding this long enough to be formally recorded as so employed affords a positive indication of some value; whereas if none, or very few, have engaged in certain other lines of work, there is at least a strong presumption that few are likely to do so until social conditions or the type of school training afforded alter radically.

SOURCES OF INFORMATION REGARDING EMPLOYMENT

In the present study, the writers have assembled certain data from the files of the After-Care Department of the San

Francisco Public Schools, covering 610 positions held by boys and girls who have passed through the ungraded classes in that city. Admission to these classes is restricted to children of IQ under 80, the median being between 65 and 70. Of the positions enumerated, 466 were held by boys and 144 by girls. The data for 135 of these cases, covering the years to 1925, were compiled by Miss Lewin[1] in a master's thesis at the University of California. These figures were supplemented and brought up to date by Miss Jeanette Nathan. As might be expected a considerable percentage of the boys and girls from these classes have been found permanently unfit for gainful employment. Some of this number have found their way into institutions; others are cared for at home. Many of the girls, even though entirely competent to undertake outside work, have by common consent remained with their families, helping about the house, or married and occupied themselves as housewives. All such cases were excluded from consideration in the present study. The figures shown cover only work of a more or less steady character engaged in for pay or gain and entered as such upon the records of the After-Care Department.

As a check upon the results, and to offset peculiarities due largely to local conditions, a study was made of the findings of similar investigations conducted in other and widely differing localities. The published reports of certain of these surveys proved insufficiently detailed for the present purpose. Intelligence levels were uncertain, returns for males and females were not separated, or positions were named without indicating the frequency of each. Four, however, were found usable; namely, the study by Miss Mary Carpenter[2] of the occupations of 207 sub-normal girls in Michigan communities;

[1] Lewin, Lillie. "The Educational Treatment of the Mentally Deficient." University of California: Department of Education. Unpublished Master's thesis. 1925.

[2] Carpenter, Mary S. "A Study of the Occupations of 207 Subnormal Girls after Leaving School." University of Michigan, *Department of Vocational Education, Special Studies*, No. 2. 1921.

the survey by Superintendent G. C. Hanna[3] of the occupations of inmates of the State School for the Feeble-minded at Faribault, Minnesota; a study by Miss Henrietta Johnson[4] of the post-school records of 447 former pupils of the atypical classes of Oakland, California; and the employment history of pupils from sixteen to twenty-one years of age in the auxiliary classes of Springfield, Massachusetts, as compiled by Mr. Harold Thomas.[5]

The number of positions held as reported in these four studies totaled 2,145, or, with the addition of the San Francisco figures, 2,755. Of this number, 45.2 per cent were held by boys and 54.8 per cent by girls, as may be seen from Table I.

Through the courtesy of the various investigators named the present writers have been permitted to republish their findings in columns parallel to the San Francisco figures. In order to facilitate comparison, considerable reclassification of the occupations named in the several studies proved necessary. It is believed, however, that this has been accomplished without undue violence to the facts. The classification to which all have been reduced is that of the five-group scale of Sims,[6] here reproduced by permission in abbreviated form:

Group 1. Professional men, proprietors of large businesses and higher executives.

Group II. Commercial service, clerical service, large land owners, managerial service of a lower order than in Group I,

[3] Hanna, Guy C. "Occupational Efficiency of the Mentally Defective." *University of Minnesota Bulletin*, Vol. XXVII, No. 55. *College of Education Monograph* No. 7. 1924.

[4] Johnson, Henrietta A. *A Summary of the Case Histories of 447 Atypical Pupils Who have Left School.* Oakland, California, Public Schools: Bureau of Research, Curriculum, and Guidance. 1928.

[5] Thomas, Harold P. "The Employment History of Auxiliary Pupils Between the Ages of 16 and 21 Years in Springfield, Massachusetts." *Proceedings of the American Association for the Study of the Feeble-minded.* 52: 133 ff. 1928.

[6] Sims, V. M. "The Measurement of Socio-Economic Status." Bloomington, Ill. Public School Publishing Co., 1928. P. 22.

TABLE I.

Number of positions held by persons of border-line or defective mentality as reported in the five surveys here compared

		POSITIONS FILLED BY MALES	POSITIONS FILLED BY FEMALES	TOTAL POSITIONS REPORTED*
Carpenter, Mary S.	Michigan communities	.....	589	589
Hanna, Guy C.	Minnesota State School	301	445	746
Johnson, Henrietta A.	Oakland California	266	155	421
Lewin, Lillie, and Nathan, Jeanette M.	San Francisco California	466	144	610
Thomas, Harold P.	Springfield Massachusetts	211	178	389
Total		1,244	1,511	2,755

* Throughout the present study, figures refer to the number of positions held, not the number of persons holding them. Thus several different positions might be credited to one individual, and none at all to another.

and business proprietors employing from five to ten men, *e.g.*, accountants, commercial travellers, high school teachers, musicians, insurance agents.

Group III. Artisan proprietors, petty officials, printing trades employees, skilled laborers with some managerial responsibility, shop owners and business proprietors employing one to five men, *e.g.*, bakers, cleaners, plumbers, etc., owning their own business; clerks in stores, farmers, foremen, railroad conductors and engineers, police sergeants, fire captains, etc.

Group IV. Skilled laborers (with exception of printers) who work for someone else, building trades, transportation trades, manufacturing trades involving skilled labor, personal service. Small shop owners doing their own work, *e.g.*, bakers, blacksmiths, cabinet makers, carpenters, chefs, cooks, electricians, engineer's assistants, firemen, janitors, locksmiths, mailmen, policemen, tenants, tinsmiths, tanners, sailors, switchmen, waiters, small shop owners employing no help.

TABLE II.

Occupations accounting on average for one per cent or more of the positions reported held by males

TYPE OF POSITION	LEWIN AND NATHAN (SAN FRANCISCO)	HANNA (MINNESOTA INSTITUTION)	JOHNSON (OAKLAND)	THOMAS (SPRINGFIELD MASSACHUSETTS)	AVERAGE PER CENT IN THE FOUR INVESTIGATIONS
GROUP III					
Shop-owners and Clerks					
Clerks in stores	0.4		3.7		1.0
Miscellaneous*	0.4				0.1
Total Group III	0.8	0.0	3.7	0.0	1.1
GROUP IV					
Skilled Laborers					
Carpenters	0.8		4.1		1.2
Gardeners	1.5	9.3			2.7
Machinists	5.5		3.4		2.2
Miscellaneous*	9.2	1.3	9.9		5.1
Total Group IV	17.0	10.6	17.4	0.0	11.2
GROUP V					
Unskilled Laborers					
Bootblacks	1.0		1.1	4.7	1.7
Brushmakers	1.7	9.7			2.9
Cannery workers	0.6		6.3		1.7
Dairy workers		4.4	0.3		1.2
Day laborers	0.4		10.1	5.3	4.0
Deliverymen (not truck-drivers)	7.4		4.5	12.3	6.1
Domestics		39.0	1.1		10.0
Factory workers†	26.9		12.0	39.9	19.7
Farm hands (other than dairy)	0.8	4.7	1.1		1.7
Fishermen	5.7				1.4
Foundry workers and blacksmith's helpers	1.3	0.6	3.7		1.4
Helpers and handy men in markets, butcher's shops, florists, etc.	6.6	0.3	0.3		1.8
Laundry workers	0.8	5.0	2.6		2.1

TABLE II. (*Continued*)

TYPE OF POSITION	LEWIN AND NATHAN (SAN FRANCISCO)	HANNA (MINNESOTA INSTITUTION)	JOHNSON (OAKLAND)	THOMAS (SPRINGFIELD MASSACHUSETTS)	AVERAGE PER CENT IN THE FOUR INVESTIGATIONS
Machine-shop men	0.6			3.4	1.0
Messengers	4.0		4.5		2.1
Net-makers (in institution)		8.4			2.1
Newsboys	1.9		2.6		1.1
Scavengers and cinder-handlers	0.4	1.9	1.8	3.3	1.9
Service station and garage helpers, car washers, etc.	2.3		4.1		1.6
Stable boys		6.0			1.5
Store work, not selling (department stores, groceries, hardware, coal companies, etc.)	3.4			5.2	2.1
Truck and wagon drivers and helpers	8.3		3.4	6.1	4.4
Wicker-workers and chair-caners		2.6	2.2		1.2
Miscellaneous*	8.1	6.8		4.3	4.8
	82.2	89.4	61.7	84.5	79.5
Unspecified Employment			17.2	15.5	8.2
Total of all groups	100.0	100.0	100.0	100.0	100.0

* For occupations designated "Miscellaneous" see Table III.

† Exact frequencies for various types of factory were not always obtainable. Kinds of factories most frequently named included bed, bolt, bottle, cake, can, candy, cap and hat, cement, chocolate, cigar, coffee, overall, paint, paper, shoe.

Group V. Unskilled laborers, common laborers, helpers, "hands," peddlers, varied employment, venders, unemployed (unless it represents the leisured class or retired), *e.g.*, bootblacks, drivers (truck and wagon), delivery men, fish peddlers, furnace tenders, night watchmen, suit pressers, messengers, and all common labor.

COMPARISON OF RESULTS OBTAINED

Table II indicates the comparative frequency of the various positions reported held by youths or men of subnormal mentality. The figure shown is in each case the *per cent* which positions of the type named constituted of the total number of positions listed by the investigator concerned. Thus, of the 266 positions reported by Johnson as held by males, eleven, or 4.1 per cent, were classified as carpentering. The right-

TABLE III.

Occupations accounting on average for less than one per cent of the positions reported in the four surveys as held by males

POSITION	PER CENT	POSITION	PER CENT
GROUP III			
Market owners (vegetable and poultry)	0.1		
Total	0.1		
GROUP IV			
Bakers	0.1	Painters	0.6
Barbers	0.4	Plasterers	0.3
Bootleggers	0.1	Plumbers	0.4
Cabinet-makers	0.1	Waiters	0.5
Cobblers	0.5	Miscellaneous (fur-cutter, floor-layer, glazier, trap-drummer, welder, wood-wagon owner, etc.)	0.4
Electricians	0.1		
Janitors	0.9		
Office workers	0.7		
		Total	5.1
GROUP V			
Bakers	0.1	Fruit picker	0.1
Bowling-alley boys	0.7	Fruit and meat packers	0.2
Cabin boys	0.1	Lumber-mill hands	0.4
Caddies	0.2	Mail-carriers	0.1
Cattle herders	0.1	Mattress-repairers	0.1
Clam-diggers	0.1	Peddlers	0.2
Cleaners, dyers, pressers	0.2	Porters	0.2
Cooperage hands	0.1	Rag sorters	0.1
Electric and radio company helpers	0.3	Rope-braiders	0.9
Freight handlers	0.4	Sailors and barge hands	0.2
		Total	4.8

TABLE IV.

Occupations accounting on average for one per cent or more of the positions reported held by females

TYPE OF POSITION	LEWIN AND NATHAN (SAN FRANCISCO)	CARPENTER (MICHIGAN)	HANNA (MINNESOTA INSTITUTION)	JOHNSON (OAKLAND)	THOMAS (SPRINGFIELD MASSACHUSETTS)	AVERAGE PER CENT IN THE FIVE INVESTIGATIONS
GROUP III						
Shop-owners and Clerks						
Clerks in stores	5.6			7.9		2.7
GROUP IV						
Skilled workers						
Telephone operators	2.0	1.0		4.5		1.5
Miscellaneous*	5.6	2.6		8.3		3.3
Total Group IV	7.6	3.6		12.8		4.8
GROUP V						
Unskilled laborers						
Cannery workers	11.1			11.6		4.5
Domestics (not nursemaids)	6.1	19.5	49.1	9.0	5.0	17.8
Factory workers†	49.5	26.9		21.2	77.6	35.0
Laundry workers	2.7	6.0	17.4	4.5	2.9	6.7
Lunch-room workers (not waitresses)		13.6				2.7
Nursemaids	2.7			3.3		1.2
Sewing-women			26.8			5.4
Store work (not selling)	3.5	27.1			3.3	6.8
Miscellaneous*	11.2	3.3	6.7	0.2		4.3
Total Group V	86.8	96.4	100.0	49.8	88.8	84.4
Unspecified Employment				29.5	11.2	8.1
Total of all groups	100.0	100.0	100.0	100.0	100.0	100.0

* For occupations designated "Miscellaneous" see Table V.

† Types of factory occurring with greatest frequency in the records of these women workers included: bag, basket, bottle, cake, can, candy, cap and hat, cigar, cracker, knitting, necktie, etc.

hand column shows the (unweighted) average of the percentages reported in the four surveys tabulated. Since neither Hanna nor Thomas show any carpenters in their lists, the average for this occupation is reduced to $\frac{4.1+0.8}{4}=1.2$ per cent.

Only those occupations which averaged one per cent or more as shown in the right-hand column are separately listed in Table II. Those accounting for less than one per cent are combined under the head of "Miscellaneous" at the close of each of the occupational groups or classes. Some idea of the variety of these miscellaneous callings can be had by consulting Table III, where those accounting for as many as one in a thousand of the males are enumerated and the average per cent shown.

In the Johnson and Thomas studies as originally published a number of the jobs held were not named specifically but designated only as "miscellaneous" employment. These were presumably occupations too infrequent to deserve separate mention, or cases in which precise information was lacking. The overwhelming majority of these doubtless referred to

TABLE V.

Occupations accounting on average for less than one per cent of the positions reported held by females in the four surveys covered

POSITION	PER CENT	POSITION	PER CENT
GROUP IV			
Actresses	0.1	Office workers	0.7
Beauty-parlor workers	0.3	Waitresses	0.6
Dressmakers and assistants	0.9	Total	3.3
Milliners	0.7		
GROUP V			
Basket making	0.9	Messenger and delivery girls	0.5
Elevator operators	0.5	Rug weavers	0.6
Fruit pickers and sorters	0.5	Upholsterers	0.4
Fur company worker	0.1	Ushers	0.5
Helpers (miscellaneous)	0.2	Total	4.3
Lampshade maker	0.1		

unskilled labor of the class of Group V. However, in the absence of definite knowledge to that effect, the present writers have thought it best to show these frequencies under a sixth group, designated "Unspecified."

Table IV gives the information concerning girls and women corresponding to that in Table II for males; similarly, Table V parallels Table III.

CONCLUSIONS REACHED

The number and variety of occupations included in the 2,755 positions held by the young men and women of the present study afford strong corroboration of the statement of Terman,[7] made early in the history of intelligence testing, that "a large proportion of the tasks in the modern organization of industry can be performed by individuals of the 70 and 75 IQ class as well as by those of superior intelligence, and with more satisfaction in the performance." That a large percentage, perhaps even the majority, of the pupils leaving our public school classes for the mentally deficient are capable of earning their own living, given reasonably favorable circumstances, is no longer open to question. The curriculum and conduct of these classes are posited throughout on this assumption.

Closer examination of the data of Tables II to V appears, however, to warrant certain further conclusions as applying under existing conditions of industry and educational facilities:

1. The chance of any boy or girl from this group attaining a position of average or better than average occupational status appears slight, indeed. Of the group studied only one in eight of the males and one in fourteen of the females are known to have engaged in work above the grade of unskilled labor, or ranking above the lowest of the five occupational groups in terms of social-economic status. The per cent of the entire

[7] Terman, Lewis M. *The Intelligence of School Children.* Houghton Mifflin Co. 1918. P. 133.

number who fell in each of the occupational classes on this scale may be seen in Table VI.

TABLE VI.

Per cent of the 2,755 positions held which fall in each group of the occupational scale

OCCUPATIONAL GROUP	MALES	FEMALES	TOTAL
1. Professional, etc.	0.0	0.0	0.0
2. Semi-professional, managerial and commercial	0.0	0.0	0.0
3. Small shop or farm owners, foremen, clerks, etc.	1.1	2.7	1.9
4. Skilled laborers	11.2	4.8	8.0
5. Unskilled laborers	79.5	84.4	82.0
Unspecified employment	8.2	8.1	8.1
	100.0	100.0	100.0

2. To this general rule of unskilled labor there are, however, certain interesting exceptions. About ten per cent succeed in establishing themselves in the ranks of the skilled trades or commercial employment, the girls as clerks in stores, telephone operators, waitresses, beauty-parlor workers, and so on; the boys as mechanics, gardeners, painters, barbers, and the like. The San Francisco study here reported revealed one man who has been employed for over five years as an expert fur-cutter at a salary of fifty-five dollars a week. Another earns from sixty to one hundred dollars a week as a trap-drummer. Two have achieved the proprietorship of a stand in the public market with paid helpers. Such instances remain, however, the exceptions which prove the rule.

3. The frequency of particular callings will, of course, vary widely with different localities and circumstances. Tables II to V reveal only a modicum of agreement among the five surveys compared. The Minnesota figures differ most widely from the rest, owing to their origin in an institution, but are included here in order to correct in part the predominantly urban cast of the other returns.

Taking the totals at face value, 21.4 per cent of the males and 39.5 per cent of the females are found engaged in factories (including canneries) against only 4.6 per cent of the men in farm and dairy work. But in rural or semi-rural communities these proportions might well be reversed. Similarly, the percentage of fishermen, sailors, fruit-pickers, lumber-mill hands, and the like would differ widely in different parts of the country. No doubt the precise frequencies here shown have only modest validity as applying to communities other than those actually included in these surveys. The tables may nevertheless prove of service to school workers as affording a fairly comprehensive list of the occupations which experience has shown that the mentally handicapped are at present most likely to enter.[8]

4. The wide diversity of activities represented in these lists, coupled with the comparative simplicity of the skills involved in any one position, render it highly questionable whether vocational training in the narrow sense of the term is a practicable objective for public school work with these groups. So simple are the majority of the tasks involved in this type of employment and so specific are the adjustments required to the equipment and practices of any particular factory or firm, that it is doubtful whether the schools could adequately train these young people for these duties. In any case the cost of providing up-to-date machinery and other facilities needed would be prohibitive for most school systems, when even the present mode of instruction in these classes costs from two and a half to three times as much per pupil as in the elementary schools at large.

Even if specific training were provided, it is very doubtful whether any large percentage of the graduates would

[8] For a list of tasks which can be successfully performed *under institutional conditions* by men and women of each mental age level from five to twelve years inclusive, the reader is referred to Beckham, A. S., "Minimum Intelligence Levels for Several Occupations." *Personnel Journal.* 9: 309–313. 1930. See also Burr, E. F., "The Vocational Adjustment of Mental Defectives." *Psychological Clinic.* 20: 55–64. 1931.

make profitable use of it. A study by W. Hofmann[9] of 150 boys trained in the auxiliary school classes of Stuttgart, Germany, found that six years after leaving school only 8 per cent were actually engaged in the trades for which they had been trained.

In the Los Angeles school system a more concerted effort is made to provide direct vocational training for these groups than in most cities. The "Developmental Class Centers" in that city offer training in auto-mechanics, power-machine sewing, furniture making and painting, plumbing, foundry, washing, polishing and painting cars, cobbling, cooking, baking, laundry, and cement work.[10] Naturally, only a few of these vocations can be provided at any one center, and the labor market for any particular line of work (*e.g.*, auto-washing) might quickly become glutted if this training came to be offered generally.

A better case can be made for training the girls in household arts. The present study shows 19.0 per cent of the women employed as domestics and nursemaids, and another 15.7 per cent in the allied occupations of sewing, kitchen, and laundry work. Nor do these figures take any account of the much larger numbers engaged in keeping house for their families, without being registered as "employed." Undoubtedly, the schools can do much to prepare these girls for their later responsibilities. Similarly, in rural communities a school farm might serve to provide practical training for the large group of boys who will enter agricultural work. Under city conditions, however, no one calling at present accounts for a sufficiently large number to render specific practical training on a comparable scale feasible. The service of the school to these children must still be essentially in the direction of socialization and "general" training, the improvement of health and motor control, the enlargement of vocabulary and

[9] Hofmann, W. "Investigation of the Vocational Capacity of Discharged Auxiliary School Pupils." *Hilfsschule.* 23: 132–145. 1930.

[10] Woods, Elizabeth L. "Special Class Activities." Los Angeles City Schools, *Educational Research Bulletin.* VII: 1. 1927.

knowledge of immediate practical utility, the development of self-confidence, and the inculcation of social attitudes and desirable habits of courtesy, industry, thrift, and the like.

Fortunately most city concerns employing labor at these levels do not demand special preparation, but expect and even prefer to train their workers on the job. As one large Oakland employer voiced the common sentiment, "(We want) boys and girls who will give an honest day's work for honest wages; who will take directions cheerfully and carry them out to the best of their ability; who will have the proper attitude towards their superiors, and who can tell the firm's money from their own."[11]

Summary

1. Of 2,755 positions reported held by graduates of the ungraded classes for mentally deficient pupils in the San Francisco public schools and similar groups in other parts of the country, only one in eight of those held by men and one in fourteen of those held by women rise above the level of unskilled labor.

2. Workers in factories of various sorts, including canneries, constitute the largest single group (21.4 per cent of the males, and 39.5 per cent of the females).

3. With 19.0 per cent of the women employed engaged as domestics and nursemaids, and 15.7 per cent in sewing, kitchen and laundry work, not to mention the even greater number helping about their own homes, training in household arts is obviously an urgent and practical vocational objective for these girls.

4. Except for household arts and perhaps certain forms of farm work in the case of schools outside of great cities, the occupations represented are so diverse and skills demanded in any one position so simple that it is doubtful whether public schools can provide specific vocational training on any extensive scale at these levels.

[11] Stevens, T. W. "The Administration of Atypical Classes in the Schools of Oakland, California." University of California: Department of Education. Unpublished Master's thesis, 1930.

THE HISTORY OF FULL-PAGE ADVERTISEMENTS

(A supplement to and revision of the work of Dr. Harry Dexter Kitson)

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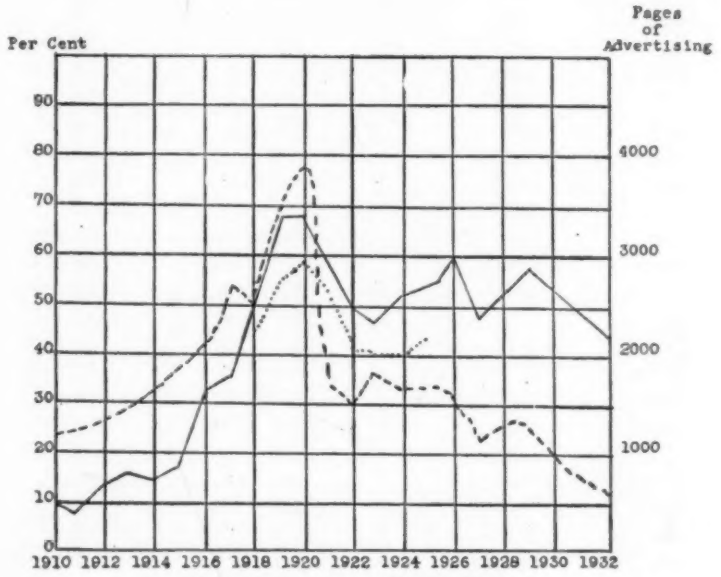
A study of the history of full-page advertisements, showing the growth of advertising and increase in space used, was conducted by Harry Dexter Kitson, Professor of Education, Teachers College, Columbia University.[1] Dr. Kitson's object in making such a study was to ascertain the trend in the use of full-page advertisements in relation to the total number of advertisements, the assumption being "that the practises which have persisted over a period of years have probably been of value";[2] and again that "they represent a sort of economic survival of the fittest."[3] Beginning with the 1910 issues of the *Literary Digest* he counted the number of pages devoted to advertising and the number of advertisements occupying a full page. A double-page advertisement was counted as two single pages. In securing his statistics for 1919 Dr. Kitson used only six months' issues, and for the years 1920–1925 he used only one month's issues of the magazine.

The authors in continuing this experiment have investigated and completed the years which Dr. Kitson left unfinished and have added the years since the publication of the latter's book,

[1] Kitson, Harry Dexter. Scientific Advertising, 1926, Chapter II.
[2] *Op. cit.*, p. 3.
[3] Op. cit., p. 4.

"Scientific Advertising," in which the original experiment is reported.

The results are shown in the accompanying table and graph. The years 1910 through 1918 are taken from Kitson. These



HISTORY OF ADVERTISING

(LITERARY DIGEST 1910–1931)

———— Percentage of full-page advertisements.

..... Kitson's results.

– – – – – – – – Pages of advertising.

charts show that the proportion of full-page advertisements increased almost seven-fold during the decade 1910–1920. During the period 1921–1923 there was a decline. In 1924 there was a rise which continued until 1926, when there was a sharp drop. Since then the curve shows a tendency to rise.

These figures may not serve precisely for all periodicals. Yet, since the *Literary Digest* is a representative general magazine, the study is indicative of the general trend.

Number of full-page advertisements (exclusive of cover) in the Literary Digest from 1910 to 1929

YEAR	PAGES DEVOTED TO ADVERTISING	FULL-PAGE ADVERTISEMENTS	PERCENTAGE OF FULL-PAGE ADVERTISING
1910	1190	117	10
1911	1188	108	9
1912	1274	182	14
1913	1468	264	17
1914	1564	252	16
1915	1769	325	18
1916	2116	670	31
1917	2716	972	36
1918	2597	1162	45
1919	3527 (2121)'	2411 (1155)	68 (54)
1920	3976 (409)''	2704 (243)	68 (59)
1921	1669 (245)	965 (134)	58 (54)
1922	1557 (144)	769 (69)	49 (41)
1923	1773 (168)	855 (67)	48 (40)
1924	1728 (157)	896 (62)	52 (40)
1925	1952 (153)	936 (67)	53 (44)
1926	1702	1027	60
1927	1145	554	48
1928	1285	706	54
1929	1359	783	58
1930	1018	534	52
1931	658	310	47

' Kitson's results with six months' issues.

'' Kitson's results with one month's issues, 1920–1925.

ON THE DETERMINATION OF THE INTELLIGENCE OF ADULTS FROM SAMPLES OF THEIR PENMANSHIP

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This brief study reports data concerning the determination of the intelligence of adult college students from samples of their penmanship. The data were assembled in the San Diego, California, State Teachers College during the first semester of 1930–1931 by the second writer. Both writers contributed to the statistical work presented here. The report in its present form was prepared by the first writer.

The study was suggested by a brief statement in a recent textbook on psychology: "Some graphologists aver that handwriting is indicative of degrees of intelligence. . . . The results are far from conclusive."[1] Starch[2] comments that "experimental work needs to be done in this field." He points out elsewhere, citing the work of several persons, that so far as adults are concerned, correlation between intelligence and handwriting is approximately zero.[3]

The first step in carrying out the study was the collection of the samples of penmanship. Two hundred and thirty-one upper division college students registered in four education

[1] Coleman, L. R., and Comins, S. "Psychology—A Simplification." New York: Boni and Liveright, 1927. Page 232.

[2] Starch, D. "Educational Psychology. Revised Edition." New York: The Macmillan Company, 1927. Pages 349–350.

[3] Starch, D. *Ibid.* Page 350.

courses were requested to copy a short prose passage. When the penmanship samples were available, three judges picked from among them fifteen samples of the handwriting of men and fifteen samples of the handwriting of women which in the opinion of the judges were typical of the penmanship of the two larger sex groups included in the study.

Decile ratings on intelligence as measured by the Thorndike Intelligence Examination for High School Graduates, Series of 1925–1929, were available for men and for women separately.[4] In order to have a second variable which may be considered as a control check, but for which no relationship with penmanship has been claimed, weight was selected. Since decile ratings on weight were not available it was necessary to obtain the weights of two hundred men and of two hundred women chosen at random from the records of the physical education departments for men and for women in the college and to compute the decile values for each of the two distributions. The true weight of each of the selected thirty subjects and the scores made by each on the Thorndike Intelligence Examination, Series of 1925–1929, were obtained. Using the decile values now available it was possible to assign each subject his or her true decile rank in weight and in intelligence.

Twenty-five adult judges were then asked to consider the thirty samples of adult penmanship, each identified only by a number, but with the sex of each writer known. A mimeographed form was used by the judges in recording their estimate of the decile group in intelligence and of the decile group in weight in which each writer fell. After an interval of ten days, the samples of penmanship were shifted about in each group of fifteen and re-numbered. The judging for weight and for intelligence decile placements was then repeated by each of the twenty-five judges. The subjects were not known to the twenty-five judges.

[4] Broom, M. E., and Bell, Gertrude S. "The Thorndike Intelligence Examination." High School Teacher, 4: 188–189, 199. May, 1928.

The average decile placements in intelligence of the thirty adult subjects as guessed first by the twenty-five judges ranged between 2.8 and 6.1 with a mean of 4.3 and a standard deviation of 0.81. On the second judgment the average decile placements for the thirty subjects ranged between 2.8 and 6.1 as before, with a mean of 4.2 and a standard deviation of 0.88. The true decile placements in intelligence for the thirty subjects ranged between 1.0 and 10.0, with a mean of 5.4 and a standard deviation of 3.21.

The judgments by the twenty-five judges concerning the weight decile placements of the thirty adult subjects are summarized similarly. On the first judgment as to the weight of the subjects, the average decile placements varied between 3.8 and 7.1, with a mean of 5.7 and a standard deviation of 1.28. On the second judgment, the average decile placement for weight varied between 4.0 and 6.4, with a mean of 5.0 and a standard deviation of 0.66. The true decile placements varied between 1.0 and 9.0, with a mean of 5.1 and a standard deviation of 2.69.

The judges apparently recognized the true decile placements of the thirty subjects in weight and in intelligence only by chance. On the first judgment of intelligence placements in terms of decile rank, recognition of the true decile placements by the twenty-five judges ranged between three and thirteen per cent accuracy,[5] with a mean of 7.7 per cent and a standard deviation of 3.6 per cent. On the second judgment, recognition of the true decile placements by the different judges varied between zero and twenty per cent, with a mean of 9.9 per cent and a standard deviation of 5.3 per cent. On the first judgment of weight placements in terms of decile rank, the twenty-five judges were able to indicate from zero to sixteen per cent of the true decile placements correctly. The mean judgment was accurate in 8.5 per cent of the instances, and the standard deviation describing the spread of judg-

[5] Percentage values indicating range limits are given to the nearest whole per cent value in this report.

ments was 4.7 per cent. On the second judgment for weight decile placements, the range again varied between zero and sixteen per cent accuracy, with a mean of 8.5 per cent and a standard deviation of 3.6 per cent.

Two series of coefficients of correlation were computed. The first included four coefficients. The coefficients for the true decile placements in intelligence with the first average decile placement in intelligence by the twenty-five judges for each subject was .16. The coefficient for the true decile placement in intelligence with the second average decile placement in intelligence by the twenty-five judges was .01. The coefficient for the true decile placement in weight with the first average decile placement in weight by the twenty-five judges for each subject was .04. The coefficient for the true decile placement in weight with the second average decile placement in weight by the twenty-five judges for each subject was .07. It is obvious that even the average judgments of the twenty-five judges are valid neither for intelligence nor for weight.

The second series of coefficients included two constants. The coefficient of correlation between the first average judgment as to decile position in intelligence with the second was .01. The coefficient between the first and the second average judgments as to decile placement in weight was .06. The average decile placements by the twenty-five judges were not at all reliable.

Several interesting conclusions result from this short study. It is as easy to judge weight from penmanship as it is to judge intelligence; neither is judged correctly except by chance. Average judgments by twenty-five adults as to decile placements in a scale of intelligence and of weight for the thirty subjects lack validity. The percentage of correct judgments of decile placements in intelligence and in weight for the thirty subjects and by the twenty-five judges lack reliability. The findings of the study agree quite closely with those reported by earlier experimenters.

IMPROPER SCHOOL PLACEMENT AS A FACTOR IN JUVENILE DELINQUENCY

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INTRODUCTION

Mental health clinics are an important activity of the Pennsylvania Bureau of Mental Health. Within the past ten years general mental health clinics have been established in various parts of the Commonwealth and have been utilized by schools, courts, physicians, social agencies, and others. Detailed information about clinic patients has been collected over a period of time and a section of the material is presented here. We present it in order to suggest a relation between juvenile delinquency and improper school placement. We shall offer data to show that patients referred to our clinics for delinquent behavior (truancy, stealing, sex offenses, etc.) are (1) mentally retarded as a group and (2) in many cases they are improperly placed in school in comparison with their mental abilities.

1. JUVENILE DELINQUENTS ARE MENTALLY RETARDED AS A GROUP

That this is true is shown in the table below. The table includes those cases referred for delinquent behavior within a certain six year period.

Number of cases—743.	
IQ 90 or above (normal)	78 per cent
IQ 70–90 (Dullness)	41 per cent
IQ 50–70 (High grade mental deficiency)	34 per cent
IQ below 50	7 per cent

The above table shows that all but 18 per cent could be classified as below normal in intelligence. However, these

figures are too low to represent the ability of juvenile delinquents in general since a selective factor is operative in the notion cherished by some community workers that a delinquent child need not be referred to a mental clinic unless he is suspected of being mentally retarded. A more accurate picture of the mentality of delinquent groups is shown in the statement by the director of a school department of child guidance, "According to our Newark figures, which are consistent with experience elsewhere, about a quarter of the delinquent pupils could be classified as 'feeble-minded.' The remainder (with few exceptions) are in the ability group below average, dull normal."[1]

2. MANY CASES OF IMPROPER PLACEMENT IN SCHOOL

We say juvenile delinquents are mentally retarded as a group. What difference should this make in school administration policies? (a) In the first place more of those suitable for special training should be in special classes, and (b) in the second place more care should be taken in classifying according to school grade. We shall show that in many cases the delinquent pupils are too far advanced in school grade in comparison with their mental ability.

Discussing the first heading above we maintain (a) *more should be in special classes.* The group testing between 50–70 IQ, which includes 34 per cent of the total above, would be potential candidates for special training. One large city system regards all pupils testing below 75 IQ and above 50 IQ as potential special class material. Yet out of the total number referred for delinquency only 2 per cent of those referred to our clinics were actually placed in special classes. That this neglect is not confined to our own state is suggested by the following quotation, "It is a tacit assumption that the vast majority of the feebleminded are being satisfactorily (if not

[1] Bruce B. Robinson, Problems of Community Management of Uninstitutionalized Feebleminded and Delinquent. Conference of Social Work, 1928. Univ. of Chicago Press. P. 370.

handsomely) cared for in our public schools. However, Wallin in a recent report shows Ohio to be woefully lacking in systematic and thorough provision for children of restricted mental capacity. A survey of Kansas schools made in 1926 shows that less than 6 per cent of the estimated number of feebleminded in the public schools is being given any kind of special educational opportunity."[2]

The question arises as to whether more special classes would reduce truancy and other petty offenses. We believe that they would. The dull child is like any other child in that constant failure makes him feel inferior and makes him lose all of his incentive so that he does not even do work up to his capacity. Interesting work, *within the limits of mental ability,* has a salutary effect upon personal and social adjustment. Dr. Robinson says,[3] "A psychologist in a junior high school reports that 80 per cent of the conduct problems referred for study ceased to be problems when their educational needs were met . . . all schools have seen their problem pupils show interest and good behavior when transferred to the special class where success was possible. Such experiences reinforce the belief that the schools' best opportunity to effect a real education in delinquency is by a wholesale correction of educational maladjustment, by making it possible for the dull pupil to progress through school from the first grade to completion of vocational training without failure, spared the discouragement of too difficult tasks, and with a curriculum suited to his ability and his interests."

The objection may be raised that some of these retarded children should be in institutions rather than special classes. This objection is well taken, ideally many of them *should be.* But it is primarily a question of cost to the public. It is simply a stubborn fact that the state cannot afford to make large additions to its institution populations. Those states

[2] Paul H. Witby and Estelle McCafferty, "Attainments by Feebleminded Children." Education, 1930. Vol. 10, p. 589 ff.

[3] *Op. cit.* P. 371.

which have made the most thorough-going provision for mental defectives (Pennsylvania ranks high among these) are able to care for only a small per cent of the total number. Estimates vary from 5 to 10 per cent of the total. These estimates are based upon assumptions concerning the distribution of intelligence, upon estimates derived therefrom of the total number of defectives in a given population, in comparison with the known size of institution populations.

(b) *More care should be taken in classifying according to school grade.* We come now to the second section of our exposition concerning the improper placement in school of mentally retarded delinquents. Having shown above that juvenile delinquents are mentally retarded as a group and that too few are placed in special classes, we shall endeavor now to give a concrete picture of the improper grading. The table below gives some idea of over-advancement in school grade. For instance, take pupils having a mental age of 5 years. All of this group in the second grade or above are regarded as over-advanced. Standards for grading are taken from R. Pintner, Intelligence Testing, Henry Holt, 1931, (p.

M. A.	N.	GRADE NOT STATED	SPECIAL CLASS	1ST GRADE	2ND GRADE	3RD GRADE	4TH GRADE	5TH GRADE	6TH GRADE	7TH GRADE	8TH GRADE	9TH GRADE	10TH GRADE	NO. OVER-ADVANCED
5 yrs. ...	25	5	0	5	12	3								15
6 yrs. ...	53	1	2	6	22	11	7	3	1					22
7 yrs. ...	74	5	6	5	14	21	10	8	1	0	2	2		23
8 yrs. ...	101	5	3	4	5	26	23	21	10	3	1	0		35
9 yrs. ...	160	16	7	3	1	9	22	41	28	18	8	7		61
10 yrs. ...	120	13	4	6	0	0	4	22	29	19	15	8		42
11 yrs. ...	77	7	0	0	0	0	2	8	16	21	14	7	2	23
Not reported	133													
Total ...	743													221
														36% of those reporting

257). For the group with a mental age of 6 years, all these in the third grade or above are regarded as over-advanced, and so on.

In the table above all to the right of the black line are regarded as over-advanced. They constitute 36 per cent of the total. It is a common practice in some schools to promote on age, disregarding the pupil's mental ability to carry the work. While this may seem desirable from the point of view of physical size, social maturity, etc., nevertheless it is to be deplored from the point of view of providing activities within the range of the pupil's ability. We believe it is a contributing cause of juvenile delinquency.

We would not be understood as suggesting that school maladjustment is more than a minor factor in juvenile delinquency; we realize that there are many factors that may lead a child into delinquent behavior. The lack of adequate recreational opportunity has been stressed by many persons. Clinics often advise the better use of leisure time, joining Y. M. C. A.'s, Girl Scout Clubs, etc. Dr. Robinson suggests (1) that the extension of the junior high school movement with its emphasis on extra-curricular activities (junior and senior orchestras, athletics, dramatic and debating societies, science clubs, glee clubs, etc.) promises much in recreational opportunity. Most studies of delinquency have emphasized unfavorable home conditions as a cause of delinquency.

We realize further that the schools alone cannot cope with juvenile delinquency. Every agency in the community must help. Dr. Norman Fenton in a recent article points out the necessity for community planning in dealing with the problem child, and he describes a traveling clinic directed by the California Bureau of Juvenile Research which visited communities under the auspices of a citizen's committee representing a combination of all social agencies active within a community, such as the school, the court, the probation department, the parent-teacher association.[4] He stated that when remedial

[4] *Op. cit.* P. 370.

work for a child was undertaken by a single agency conflict of interest among various groups all too often interfered with the smooth working of the planned program. The consequence of the co-ordinated effort was that the community instead of throwing up its hands and sending a child away to a state institution was able to keep the child at home and make an adjustment there. Of about two hundred pre-institutional cases only two were actually sent away from their own communities.

But suitable educational opportunity, while it cannot solve all problems of emotional maladjustment, is a powerful therapeutic measure. Opportunity for mental activity within the range of a child's abilities will help solve his emotional conflicts. A distinguished psychologist stated that when she had completed a thorough study of a child's abilities and placed him in a job in the institution to which he was mentally fitted she had partly solved his emotional problems. When a case of emotional difficulty is referred to her she concentrated upon finding him a job for which he is mentally suited and this indirect method succeeds to a surprising degree.

Finally, we offer this material as indicating only one direction of effort in dealing with the baffling problem of juvenile delinquency. We wish only to submit the proposition that the schools, in failing to take sufficient account of individual differences, have not contributed to their full capacity in the solution of this problem.

STUDIES OF TYPOGRAPHICAL FACTORS INFLUENCING SPEED OF READING

IX. Reductions in Size of Newspaper Print*

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The problem of the preservation of newspaper accounts of historical events is receiving increased recognition by historical scholars and librarians. Since newspaper stock deteriorates so rapidly it is generally recognized that some method of reproducing newspaper articles on more durable paper stock must be relied upon for permanent library files. The adoption of such a policy suggests at once the possibility of reducing the size of the newspaper reproductions in order to economize with reference to library filing space and cost of materials. The question arises,—To what degree can ordinary newspaper print be reduced without undue loss of legibility?

One of the most effective methods of reproducing newspaper material is the planographic offset-printing process. Clearness of reproduction combined with low cost constitute the chief advantages of this method in comparison with photostatic reproduction. For this reason our experiment

* This investigation was conducted at the request and with the financial assistance of the Joint Committee on Materials for Research of the American Council of Learned Societies and the Social Science Research Council. The writers are indebted to Dr. Robert C. Binkley, Secretary of the Joint Committee, for his interest and support of the study, to the Educational Test Bureau, Minneapolis, Minn., for permission to reprint the Chapman-Cook Speed of Reading Tests, Forms A and B, for experimental purposes, and to the English Department staff at the Iowa State College, for permission to test freshmen English classes at that institution.

was designed to determine quantitatively the loss in legibility which occurs when the offset-printing process is employed to reduce newspaper print by certain amounts. By comparing efficiency in reading Mergenthaler's Ionic newspaper linotype when reproduced at natural size by the planographic offset-printing process and when reproduced at certain specified reductions by the same offset-printing process, it was possible to determine the loss of legibility induced by such reductions in size.

Theoretically, the relation between offset-printing reductions and speed of reading should be determined by testing a large number of reductions, each differing slightly from every other beginning with minimal reductions and ending with reductions so great that the printed words are no longer identifiable by means of the naked eye. Such a program would be very expensive and, from a practical point of view, unnecessary. For this reason, our experiments were confined to the testing of only a few selected size reductions. The results permit construction of a curve showing the probable loss of legibility for any desired amount of reduction. The size reductions chosen for direct testing were: 80 per cent of newspaper size, 50 per cent, and 30 per cent.

METHOD

The method employed in this investigation may be briefly described as follows: Forms A and B of the Chapman-Cook Speed of Reading Tests were printed using Mergenthaler's Ionic newspaper linotype, 6¾ point on 7 point body. Form A was then reproduced at original size by the planographic offset-printing process. Form B was likewise reproduced at original size by the same process and was used along with Form A as a control to demonstrate equivalence of difficulty for the two forms. The 90 students thus tested constitute our "control group" (Test Group I). For Test Group II (90 students), Form B was reduced to 80 per cent of original size and was used along with Form A to yield a measure of

speed of reading 7 point newspaper print when thus reduced and when not reduced. In similar manner, Form B was reduced to 50 per cent of original size and reading scores obtained for Test Group III. Finally, Form B was reduced to 30 per cent of original size and administered to Test Group IV. As indicated, each Test Group was composed of 90 students, making a total of 360 students included in the total study.

Since Forms A and B, when typographically identical, are equivalent in difficulty, it follows that any significant reduction in speed of reading Form B in comparison with speed of reading Form A will be due to typographical changes (reduced size) in Form B.

The typesetting company followed standard newspaper practice in arranging the *printing forms* for Form A and Form B. Although ordered to set the type solid, nevertheless, they inserted 1 point leading in the first printing unit in the first column of the tests in order to make the two columns even in length. The other five printing units in each test were set solid. As will be shown later this had an important influence on the results obtained when Form B was reduced to 30 per cent of its original size.

The tests were administered to small groups of students in rhetoric classes at the Iowa State College, Ames, Iowa. Excellent cooperation from instructors in charge and from the students was elicited. None of the students had previously taken the Chapman-Cook Tests. The four sets of tests were systematically distributed for administration in each of the classes. The real purpose of the experiment was not explained and each student was led to believe that all other students were being given the same two test blanks. The incentive provided was promise of report concerning each student's speed of reading in comparison with his fellows. The time limit was 1¾ minutes for each test. Since each form of the Chapman-Cook Test is composed of 30 paragraphs of 30 words each it is possible to reduce obtained scores to a "words per second" basis.

The score for each student in each test is the number of paragraphs read, objectively determined by the special technique invented by the late Dr. J. C. Chapman. It so happens that college students maintain a 99.7 per cent accuracy on these tests, thus the test scores reflect speed uninfluenced by the factor of accuracy.

Mere inspection of the test forms shows that reductions to 50 per cent are fairly legible whereas the 30 per cent reduction is blurred and can be read only with great difficulty. The experiment itself confirms this impression and in addition permits a precise quantitative statement of the effect of these reductions on the actual speed of reading.

RESULTS

Detailed results are presented in Table I. Column 9 shows that there is no statistically significant difference in rate of reading Form B reduced to 80 per cent of the size of Form A (Test Group II). For Test Group III, however, reduction to half- size is accompanied by a statistically significant retardation in speed of reading. However, this does not mean that the difference is significant from the practical point of view. The retarding effect amounts to approximately half a word per second (0.45) which is negligible in view of the practical advantages of such a size reduction in the preservation of historical materials.

The results for Test Group IV present an entirely different picture. Reduction to 30 per cent of original size comes close to the lower limits of legibility. The average score on Form B made by Test Group IV was 4.00 paragraphs. Since the first printing unit of five paragraphs was leaded 1 point, it would appear that such leading itself was largely responsible for enabling the average student to make even such limited progress. However, our detailed data sheets show that 29 of the 90 students were able to read one or more additional paragraphs in the section of the test set solid (scores of 6 or more). The difficulties encountered by students in

TABLE I

Relation between offset-printing reductions and speed of reading

Differences given are for the mean score on Form A, 7 point Mergenthaler's Ionic newspaper linotype, 12½ pica line, minus the mean score on Form B, typographically identical, and reduced to 80, 50, and 30 per cent of original size by the planographic offset-printing process. The mean score is the average number of paragraphs of 30 words each in the Chapman-Cook Speed of Reading Tests read in 1¾ minutes. In each sub-group, N = 90 freshmen students in English, Iowa State College.

TEST GROUP	TEST FORM AND AMOUNT OF REDUCTION IN SIZE	MEAN	$P.E._{dist.}$	$P.E._{M}$	DIFFERENCES BETWEEN MEANS IN		$P.E._{diff.}$*	$\frac{D}{P.E._{diff.}}$
					Paragraphs	Words per second		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
I	A, 7 pt., 12½ pica	14.61	2.93	.31	+0.12	+0.03	.16	0.75
	B, 7 pt., 12½ pica	14.73	2.79	.29				
II	A, 7 pt., 12½ pica	15.38	2.98	.31	−0.18	−0.05	.17	1.03
	B, red. to 80% of A	15.20	2.43	.26				
III	A, 7 pt., 12½ pica	15.30	2.67	.28	−1.59	−0.45	.16	9.67
	B, red. to 50% of A	13.71	2.37	.25				
IV	A, 7 pt., 12½ pica	15.07	2.98	.31	−11.07	−3.16	.21	50.72
	B, red. to 30% of A	4.00	1.79	.18				

* $P.E._{diff.}$ values in column 8 were computed on the basis of the standard formula for determining the statistical significance of obtained differences for correlated measures. The correlations for the four sub-groups in this experiment were +0.86 ± .02 for Group I; +0.83 ± .02 for Group II; +0.82 ± .02 for Group III; and +0.73 ± .03 for Group IV.

reading this test material at all is shown by the fact that 15 students made a score of 0.

Inferences with regard to the legibility of intermediate size reductions may readily be made by inspection of the curve in Figure 1. The curve takes a sharp drop just beyond a size

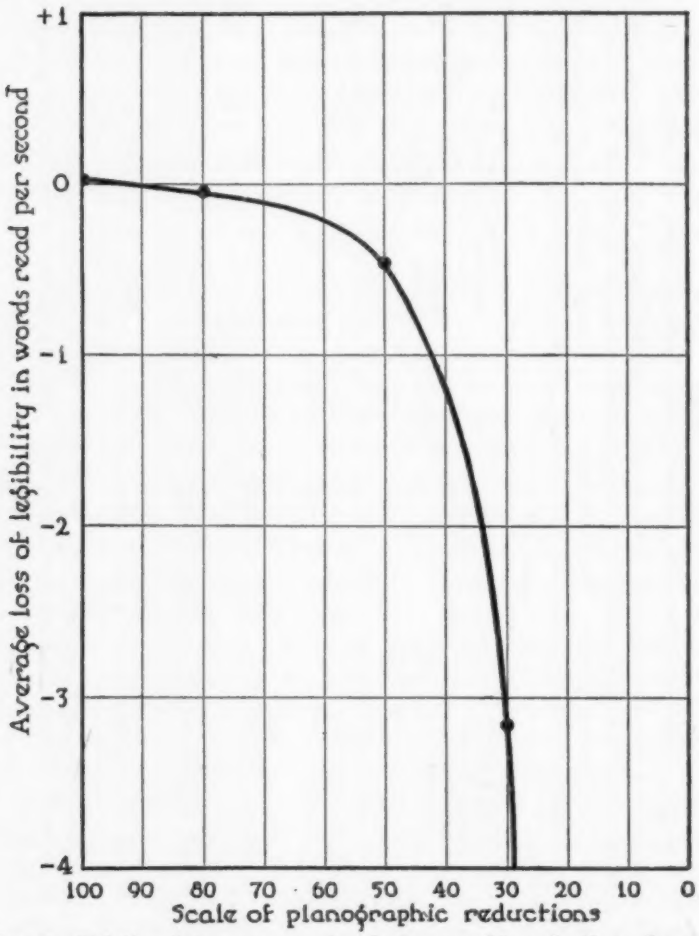

FIG. 1. Relation between amounts of planographic reduction of newspaper print and loss of legibility.

reduction of 50 per cent. If one desired to discover empirically at exactly what point below 50 per cent reduction the marked loss in legibility takes place, it would be necessary to conduct another similar experiment using reproductions more finely graduated between half-size and 30 per cent. At the present time, one would be justified in concluding that reductions to half-size may be made without undue loss of legibility.

THE SHORT ARMY PERFORMANCE SCALE IN CLINICAL PRACTICE

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Among performance scales the Army Scale[1] has an advantage over most others in adult clinical work in having been standardized on a large number of adults so that limitations due to physiological development do not affect the scores. Other advantages are that it is easy to administer; that it can easily be made acceptable to most adults; and that it can be given relatively quickly.

With increasing use of the scale however other applications have been made beside the original one of estimating general intelligence. One is to consider that if the score is markedly lower than those of more verbal tests it is an indication of poor mental functioning which offers a poor prognosis for adjustment even at a low level. Another use is to consider that great unevenness among the separate test scores is indicative of poor mental functioning. In this use the assumption is that although no two tests of a scale are supposed to give the same results in measuring an individual, there are limits to differences to be expected under normal conditions and that too great discrepancies are apt to be due to some pathological condition rather than to individual differences.

While this may be a generally valid assumption, it has its limitations for it neither takes into account incipient malfunctioning in which one can do tests of a concrete nature on which it is relatively easy to concentrate long after it is difficult to control ideas; nor does it take into account very deteriorated persons who are down to extremely low levels in all kinds of response even the recall of old learning and who

[1] Army Mental Tests, Yoakum and Yerkes, Henry Holt & Co., 1920.

may show less of the typical pathological scattering than do normal persons. It also fails to consider the fact that there are greater differences at some ages than at others.

Another not-sufficiently-considered custom is to omit tests from the scale either to save time or because of the belief that they are standardized too low and do not do justice to the subject's intelligence. The following observations are presented because it was noted that in a group of girls mostly from twelve to fifteen years old and mostly of borderline and dull-normal intelligence, age seemed to be an important factor in the results since maximum scores were very often obtained on one of the tests which older subjects of the same mental age had seldom if ever finished within the time limit. The scores averaged so much higher that *not* to score higher seemed to be of adverse significance. This led to questioning whether the scale as a whole was too high or too low for subjects younger than was the army age; also whether it was too high or too low for subjects older than the army recruits; and whether separate tests possibly showed too great a constant deviation either above or below the norm.

Though none of these questions can be finally answered, it is purposed to see what these data show and to learn whether the impressions gathered in practical work are supported by any statistical evidence. It is purposed to show the need of further research before we can use the Army Performance scale either as a basis for determining approximate mental levels with all kinds of subjects or for detecting poor mental functioning.

The tests used in this study are the Terman Scale (long form with no substitution of alternates for the regular tests), and six tests of the Army Performance Scale: namely, Ship, Manikin and Profile, Knox Cube, Memory of Designs, Digit-Symbol, and Maze. The Cube Construction test will be spoken of separately, as it was in use only a part of the time and is not included in the comparisons of the scale as a whole with the Terman Scale.

The subjects were non-psychotic subjects partly from a state institution and partly prisoners. The ages range from 12 to 50 with the majority 15 or 16 years of age. The mental ages are from 6 to 17 with the majority at 10 and 11. As a result of the latter fact the observations cannot be considered applicable to the average population.

COMPARISON OF SCORES WITH THOSE OF THE TERMAN SCALE

The correlation between the Terman Scale and the six-test performance scale is $.70 \pm .02$. The interquartile range of scores is as follows:

No.	1	1	3	17	25	48	58	48	23	21	4	10	1
M.A.	4	5	6	7	8	9	10	11	12	13	14	15	16
Q1			7	8	9	8	9	10	11	12	12	15	
Med.	7	8	8	9	9	10	11	11	13	14	14.5	15.5	16
Q3			9	10	10	11	12	12	14	15	15	17	

Of the 259 subjects, 159 score higher on the performance scale; 61 score within the same year; and only 39 score at all lower. The average differences between the two scales at different mental levels are as follows:

("+1:6" means 1 year 6 months higher than mental age)

M.A.	5	6	7	8	9	10	11	12	13	14	15	16
D.	+2:1	+1:6	+1:3	+0:11	+1:1	+1:3	+0:8	+0:10	+0:9	−0:0	+0:4	−0:0.4

The average differences between the two scales at different chronological ages are:

C.A.	12	13	14	15	16	16	18–	20–	22–	25–	30–	40–	50
No.	3	29	42	63	30	13	16	9	12	16	15	9	2
D.	+1:2	+1:6	+1:3	+1:7	+0:10	+0:8	+0:10	+0:5	+0:8	+0:8	+0:2	−1:1	−1:2

These figures show that though the scale differentiates the mental levels of subjects under thirty years of age, there is a constant plus difference in score which gradually decreases with age. Subjects from 12 to 15 years old tend to average

more than a year higher than their Terman ratings; those from 16 to 29 average more than a half year higher; at 30 years of age the two tests tend to score the same; but at some age between 35 and 40 the performance scores begin to average lower. The correlation with C.A. is −.368 exclusive of persons over 40.

These six tests may overrate persons from 12 to 15 years of age who are 14 and 15 mental age, but there are not enough cases to prove the point. Subjects from 20 to 30 chronological age have scores nearest to those of the Terman scale but even these are somewhat higher—probably for two reasons: because of the inferior mental level of so many of the subjects who are nevertheless physically mature and can work about as quickly with a test when it is once understood as can persons of higher mental level; and, secondly, because of the omission of the Cube Construction test.

When we consider the differences at the different mental levels, it is to be noted that they are greatest at 10 mental age and below, and that they are large up to and including 13 mental age. From this we may infer that probably adults who are below average intelligence and not more than 35 years of age would score higher on this group of tests than on the Terman scale unless motor responses were slowed either because of mental impairment which causes inferior mental control or because of defects associated with age; and that to score higher does not necessarily mean unusually good motor ability and control. Also, that to score lower probably shows poor mental functioning with poor vocational chances if not some incipient pathological condition. Slower work may be natural to some especially feeble-minded subjects who cannot adjust in any vocation; and it may be characteristic of many who are indefinitely described as schizophrenic. In the latter cases no psychotic condition may necessarily be implied.

The data also suggest that the use of this or similar examinations in studies which are made to compare persons of different racial stock, or to compare the mental ability of

younger persons with older persons of the same family can easily lead to erroneous conclusions unless the differences due to age are considered together with the reliability of the particular battery of tests used, since younger persons of equivalent intelligence tend to work more quickly and to score higher than do the older ones. The intelligence of younger immigrants may not be as much increased by education and opportunity as has sometimes been thought, the illusion of such increase probably being due to failure to separate the results of the greater speed of youth from ability to understand. Here, in an English speaking group, we find differences between the younger and older similar to those which are often interpreted as due to language or educational handicap.

As to the results when the Cube Construction test is a part of the scale, the following figures show the difference from the Terman scores for 35 subjects on the test alone, and on the scale as a whole both when it is included and when it is omitted.

Age	12–15	16–20	25–30	43
No.	10	14	10	1
Cube	+0: 6	−0: 11	−1: 0	−5: 7
Six tests	+1: 3	+0: 10	+0: 6	−1: 1
Seven tests	+1: 6	+0: 5	+0: 2	−2: 7

Subjects from 16 to 30 years old are seen to have scores in closer agreement with the Terman scale when this test is included than without it. In fact, 17 subjects from 18 to 30 years old averaged only one month lower; that is, they scored practically the same on the two scales. The subjects from 12 to 15 years old were still overrated; but the older subjects were not as much overrated when it was included—a fact which serves to emphasize the necessity of considering age when interpreting results. After 40, scores on this test may be so markedly low that they cannot be considered as at all indicative of mental level unless ability to understand and the method used are scored separately from the time and unless there is other corroborative evidence.

If its limitations are understood it is too valuable a test to be omitted from the scale, for it offers a real problem to persons of inferior intelligence, and the way it is done tells much more than does a test which can be grasped at a very inferior level of comprehension and the score of which depends mostly upon keeping what one is doing in mind. When it is included the scale gives a truer approximation to mental level. For analytical work in a clinical setting it is a test which would profit by a further standardization—one in which adults of different ages would be separately considered, and in which comprehension scores (understanding what to do) would be separate from time scores, so that the former ability could be recognized when movements were slowed due to other causes. The comprehension score would be of greater importance in considering the possibility of inferior intelligence; but consideration of the time score would be important in considering vocational possibilities or possible mental confusion.

From the preceding data the following tentative conclusions may be drawn:

In interpreting scores of the short Army Scale it is necessary to take the chronological age into consideration—not merely whether one is too old to function with normal speed, but whether he is so young that because of the emphasis which the scoring places upon time, the scores overrate his ability when used in place of a language scale. These six tests usually overrate non-psychotic subjects who are from 12 to 25 years of age when their intelligence is at or below the 13-year level, and the school ability of such subjects is usually a year lower than this scale indicates. When subjects score higher on this scale it does not necessarily mean that the Terman Scale has underrated them nor that they have some special "motor" ability, but rather that they are responding as persons of their mental level and age usually respond to such tests. To have a score which deviates more than two years below the mental level is unusual and probably of adverse significance.

THE SEPARATE TESTS

The other use of the scale which has grown up in clinical practice and which was not foreseen when the scale was devised is to determine poor mental functioning either by observation of differences between scores and the mental age or by observation of the unevenness of the scores of the separate tests. For this use it is necessary to know how much deviation can be considered normal; how much shows superior functioning in the particular test used; and how much is probably indicative of abnormally poor functioning if not of pathological significance.

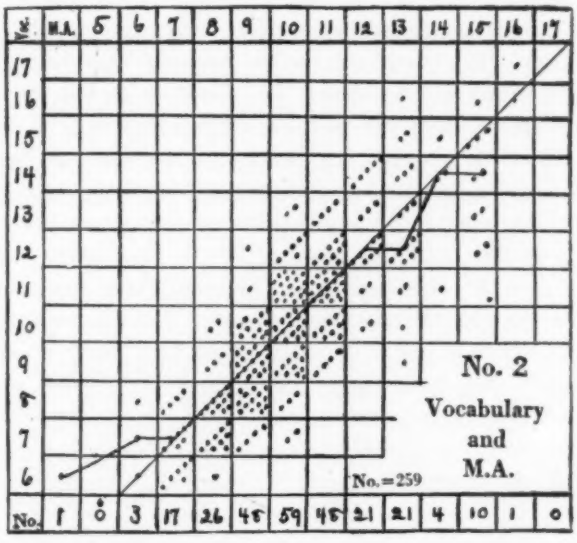
In interpreting the differences between total score and mental age it must be remembered that the relation of the score to level of comprehension is more important than any score by itself; that is, to be able automatically and sometimes almost unconsciously to make responses which have required high intelligence to learn is less important in daily adjustment to new situations than the ability to do well and with clear consciousness things which may require only inferior intelligence.

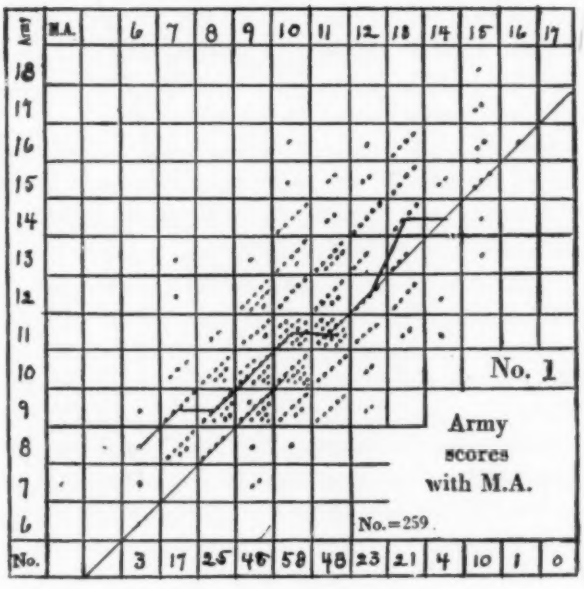
Because of the greater importance of this relation over gross scores, any score may have more than one meaning. A high score may mean that a person of inferior intelligence is functioning unusually well, or it may be a normal score for a person of average intelligence. A low score may mean that a person of average intelligence is functioning abnormally poorly; or it may be a normal score for a person of inferior intelligence. In no case can it be understood without reference to a distribution showing the separate scores for a person of the same mental level.

The distribution of scores (see graph 1) shows that it is unusual to score three years above mental age. Only 5 per cent of this group scored as high relative to their mental level and it probably indicates unusually good mental functioning with clear thinking and good attention.

To score three years *below* the mental age probably indicates unusually poor mental functioning. Less than 1 per

The slanting straight line from lower left to upper right is the line about which all scores would cluster if there were perfect correspondence between the two scores.





cent score that much lower. Consequently, in clinical work an attempt should be made to ascertain whether the cause of such a difference be more closely related to the muscular part of the response or to lack of mental clearness.

A defect in the use of the mental age as a basis of judgment is that it tends to be lowered by whatever factor may lower the Army score and the possible inefficiency may not be detected. For this reason it is better to use the vocabulary as the basis of comparison since it taps old learning which correlates highly with intelligence without requiring the impression of new data or being affected by the time limits. Graphs 2 and 3 give the distribution of the vocabulary scores in relation to Army scores and to mental age. These show that when it is important to get a quick idea of both level of abstract intelligence and the mental functioning of English speaking adults, the vocabulary test together with the short Army Performance Scale is probably as good a group of tests as one could use at present because of the quick detection of gross sensory defects and inadequate functioning, with a reliable estimate of abstract level. And with psychotic subjects who are liable to fail just those tests of the Terman scale which depend upon mental clearness in new situations, the vocabulary is undoubtedly a better base than the Terman Scale for the detection of poor mental functioning.

In interpreting the meaning of the "scatter" of the scores of the separate tests of the scale it is necessary to compare each with those made by subjects of the same mental level.

1. Ship Test. Interquartile range:

No.	1	1	2	18	21	45	54	41	21	17	6	8	1
M.A.	4	5	6	7	8	9	10	11	12	13	14	15	16
Q1				9	9	9	10	9	12	11	9	14	
Med.	15	7	5.5	9	11	10	12	12	14	14	14	14	14
Q3				11	12	12	14	14	15	15	14	15	

This is not differential above 12 mental age since both borderline and average subjects tend to score the same and it is common for inferior adults to score much above mental age.

Its value for adults is more in its failures than its successes and for them to score three or more years below is of sufficient significance to need explanation as it could be due to undeveloped visual perception of form, to an inferior stage of psychomotor control, or to poor mental functioning. To score very high indicates good mental efficiency but not unusual intelligence since the test is readily understood at 10 mental age and medians change little after 12 M.A.

2. Manikin and Profile. Interquartile range:

M.A.	4	5	6	7	8	9	10	11	12	13	14	15	16
Q1				9	9	9	10	10	10	10	11	10	
Med.	9	10	7.5	9	10	10	11	11	13	13	13	12	15
Q3				10	10	14	13	15	17	15	15	15	

This test is seen to be subject to the same limitations as the Ship Test. It is not differential above 12 M.A. and the lower levels are not clearly differentiated from each other. Its low scores are of value in indicating serious defects. High scores for persons of 9 M.A. and below would indicate mental clearness, but they would tell little about a person of higher mental level as the tests are too easy to require much concentration and effort.

3. Knox Cube. Interquartile range:

M.A.	4	5	6	7	8	9	10	11	12	13	14	15	16
Q1				8	8	9	9	11	11	11	9	13	
Med.	9	6	8	9	9	9	11	11	13	13	13	18	17.5
Q3				11	9	11	13	13	13	13	13	18	

This test shows a better correlation with mental age than the preceding ones and tends to differentiate very superior subjects from others, beside distinguishing the dull from the very inferior. It is a valuable test in clinical work when quality of response becomes more illuminating; for beside giving a measure of memory fixation, its variability gives important diagnostic clues either by showing slow comprehension of the problem and slow warming up with failures in the easiest series while more difficult ones may be done correctly, or a variability throughout the test due to poor concentration. On

the other hand, it may show such quick perception and good mental control as to preclude the idea of any abnormal mental condition.

4. Drawing Designs from Memory. Interquartile range:

M.A.	4	5	6	7	8	9	10	11	12	13	14	15	16
Q1				7	8	8	10	10	11	14	12	15	
Med.	5	7	7	8	9	10	12	12	13	15	14	17	17
Q3				10	10	11	14	14	14	15	15.5	17	

The correlation with M.A. is .64 ± .02.

The correlation with vocabulary is .58 ± .03.

The average differences at different *chronological* ages are:

C.A.	12	13	14	15	16	17	18	20–	25–	30–	49–	50–
No.	2	29	47	73	36	14	14	26	10	17	8	2
Dif.	+1:0	+1:1	+0:2	+1:4	+1:4	+1:6	+0:3	+0:4	+0:2	+0:1	−2:4	−1:3

These figures show that from 18 to 39, the ages on which the test was standardized, the scores and mental ages tend to be within the same year. Ignoring differences of less than a half year which are less important with adults than with developing children, the scores agree with mental level. Below these ages scores tend to be a year higher, except at 14 where they are practically the same, and above 39 where they tend to be lower.

Average differences from M.A. at different levels:

M.A.	44	5	6	7	8	9	10	11	12	13	14	15	2
No.	1	1	3	17	23	47	61	58	26	27	8	12	16
Dif.	+1:10	+2:0	+1:2	+1:1	+0:1	+0:11	+1:4	+1:1	+0:0	+1:3	−0:3	+0:11	+0:8

Here we see that the group tends to score higher at every level except at 12 and 14. That this difference is partly due to differences in chronological age is shown by comparing these scores with those of 249 adults who were controls in a former study. As this group did not have the Terman scale, comparisons are made by taking the vocabulary score as the measure of mental level. These differences are not as finely measured, the vocabulary score being in years only and the

performance scores being considered the same if from one month to eleven months higher. The average differences from vocabulary scores are as follows:

M.A.	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
15–17 C.A.	+2	+1	+2	+1	+2	+1	+2	+1	+1	+2	0	0			
18–30 C.A.	+1	+1	0	0	+1	0	+1	+1	0	0	0	0	−1	−2	−1

This older group shows differences which corroborate those shown by the older persons in the group being studied. The figures indicate a general tendency for younger persons to be overrated by this test as much as one or two years, up to and including 15 M.A. The group from 18 to 30 years old tends to score the same as their mental level. For them the test proves to be particularly well standardized at the average mental levels, beside tending to differentiate both an inferior and a very superior group.

From this it follows that in measuring the ability of persons whose mental functioning is interfered with by some secondary factor, a group of persons from 15 to 17 years old would not, except in advanced stages, show defect as measured by this test unless it were considered in relation to the mental age and the chronological age of the subject. In interpreting the scores it is important to remember that to score more than two years below the estimated mental level up to 40 years old indicates poor mental functioning and that to score more than three years below would suggest the need of further study.

This test is probably of more diagnostic value than any other single test of the scale so far considered. This may be due to the fact that success depends as much on the ability to express what is seen symbolically and then remember the descriptive words as on pure memory impression; but clearness and duration of the after images also seem to affect the scores and to account for the relatively high ones made by a few mentally deficient persons and by persons who are in a borderline stage of mental impairment.

5. Digit-symbol Test. Interquartile range:

M.A.	4	5	6	7	8	9	10	11	12	13	14	15	16
Q1				8	9	9	9	11	13	14.5	15.5	19	
Med.	5	9	9	9	10	11	13	14	15	17	17	19	17
Q3				10	13	14	16	16	16	18.5	18.5	19	

The increase both in median scores and in scores at the limits of the interquartile ranges indicates good correlation with intelligence which gives it value in individual work; but it is important not to let this blind us to the constant plus deviation from mental level. It is evident that this one test tends to raise the average so much that general ability as a whole is overrated unless enough tests which tend to score lower are used. The medians are from 2 to 4 years above the mental age, the greatest difference being near average levels, and it is not unusual for the Q1 to be higher than the Terman median. Of 290 subjects only 5 scored as much as 2 years below their M.A. and two of these were between 30 and 40 years old.

It is the relatively high scores which young subjects are apt to make on such a test as this which causes the impression among inexperienced workers that the Terman scale much underrates them. The same fact also helps explain a correlative impression—namely that the maze test is standardized much too low when really the maze is closer to mental age than the digit-symbol test, its extreme lowness of standardization being partly an illusion due to its relation to this test and partly because it is one of the tests which tends to average lower than mental level.

In interpreting the scores it is obvious that to score above the Terman level is normal and that such a score is not indicative of extraordinarily good psycho-motor control; also, that scattering on the scale as a whole when it is due to high scores on this test is not an indication of very good mental functioning unless it is 4 or more years higher. Scattering due to very low scores on this test is another matter and is suggestive of poor mental functioning whatever the cause may be.

For clinical work the Woodworth-Wells substitution test is probably better than this digit-symbol test, as the responses have been practised to an almost automatic level as regards the attention required to make the figures so that their quality probably does not affect the time, and what is left to affect the score is the motor control, memory, and the clearness with which the problem is kept in mind. In order to make this test of more value and the whole scale a more useful supplement to a language scale as well as a better measure of general intelligence, it should be standardized for both time and the quality of the symbols made at different ages.

6. Maze: It will be recalled that the same mazes are used in the Army Scale as are in the Porteus Scale, the difference being that the Army Scale begins at the 10-year level, thus failing to give as much preliminary practice. This lack is compensated for, however, by a careful demonstration of the first maze to be done. Another difference is that this one has a time limit so that promptness and efficiency affect the scores as well as carefulness, visual range, and one's ability to understand. The correlation with mental age is .70 ± .03.

The interquartile range of scores is as follows:

M.A.	4	5	6	7	8	9	10	11	12	13	14	15	16
Q1				7	7	7	7	8	8	11	12	9	
Med.	6	6	7	7	8	9	9	9	10	12	12	12	14.5
Q3				9	9	9	11	10	12	15	15	18	

All the scores average lower than the M.A. except from 7 to 9 where ability to comprehend the problem and visual range probably have more effect. It is evident from these figures that this test is needed when the scale is used to get an approximate mental age.

When using it as a basis for the determination of poor mental functioning it is essential to keep in mind the fact that above 9 M.A. subjects tend to score 2 or 3 years lower than their mental level and that for a person 40 years old or more to score 3, 4, or even 5, years lower on the maze may merely mean that he is responding less quickly than he once did due

to physical causes, while his consciousness is clear and his mental functioning normal. Not to remember these age differences especially in subjects who do little paper and pencil work tends to make one underrate older foreigners and adults. It is certain that we cannot infer that an older person is either mentally deficient, or lacking in caution, or mentally confused, without the corroboration of other tests which do not require pencil and paper and the responses to which are not timed. In fact, to work slowly is indicative of carefulness, and for clinical purposes the test should have two scores—one which would indicate visual range and comprehension and the other to show the efficiency with which the test can be done.

SUMMARY

In this report the purpose has been to point out the necessity for further research before using the performance scale either as an indication of approximate mental level when other tests cannot be given, or as a basis for determining mental mal-functioning whether that determination be made by observation of the difference from verbal tests or by observation of the scatter in the results of the separate tests of the scale.

It has been pointed out that in its use as an intelligence test subjects below thirty years of age score higher than their mental age on the six-test scale, the greatest difference being from 12 to 15 years of age: that the originators of the scale did not particularly recommend the six-test scale, and the custom of omitting tests when it is more convenient to do so, or for logical reasons the validity of which is not proven, make it necessary to point out the constant error ignorance of which may lead to erroneous and possibly harmful conclusions. There is some evidence to show that when it is used in place of a verbal scale the Cube Construction test should not be omitted from the battery.

The scores on the separate tests clearly indicate that one cannot use them as a basis for diagnosis and advice without

first ascertaining not only whether each test tends to raise or lower the total but also how great the tendency is both at different mental levels and at different ages. High correlations of scales and of the separate tests of scales with chosen criteria should not blind us to the constant deviations of scores which, just because they *are* constant, do not affect the correlation.

These results have not been subjected to careful statistical analysis because the group was not chosen for the purpose of such a study and may be the result of a selection unknown to the writer. Separating mental ages for purposes of comparison, as has been done, obviously precludes differences in mental level as a cause of the facts noted: that a selection may have been unintentionally made in sending to the institution persons of unusually good mental efficiency relative to the abstract level remains as a possible explanation of generally higher performance scores than Terman scores. That this is not the only cause, however, is shown by complementary evidence* which showed that performance tests standardized on children gave constantly lower scores to adults.

The data point to the need of measuring the important factor in tests, which would be the ability to understand what to do, separately from the time it takes to do it, and of expressing the two scores separately. *Scales should be so arranged and so easy to analyze that even inexperienced examiners would not mistake a subject of high abstract intelligence and poor mental functioning for one of inferior intelligence;* and when scales are so arranged that the results can be readily analyzed into comprehension (the degree of which would be equivalent to one's degree of abstract intelligence), memory, and time, we will probably be able to learn more about a patient in thirty minutes of scientific observation than we now know after two or more hours of painstaking work with

* A Note on the Pintner-Paterson Performance Scale. Harriet Babcock. Journ. Abn. & Soc. Psychol. Vol. XXVII, No. 1, 1932.

instruments which furnish measures which we are as yet unable adequately to interpret.

Those who devised the Army Performance scale did not plan it for mal-functioning individuals, nor for children, nor for the old. Its use for the first purpose has been forced upon clinical workers because of the lack of needed instruments of measure, just as the study of scattering has grown up in the use of the Terman scale.

It is now time for research workers to determine the validity of those clues which have had the illusion of being enlightening.

GROUP DIFFERENCES AND SPANISH-SPEAKING CHILDREN—A CRITICAL REVIEW

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Differences, as revealed by tests, in the ability of children in groups each of which is homogeneous as to race, language, socio-economic status, or other criteria have been explained in several ways by the investigators noting them. Spanish-speaking children have received attention in a number of these investigations and have been classed as inferior to English-speaking American children on the basis of test results. It is of interest to note the extent to which findings for the former group are in agreement with the findings for other groups representing similar conditions or "problems."

Because of the extent to which non-hereditary influences are involved in differences in test results, it seems advisable to refer to them as *group* differences rather than *racial* differences. The influences involved may be classed under one of three headings—hereditary, environmental, linguistic—according as to which of three complex factors is considered chiefly responsible for the inferior or unusual test results of the group under consideration. Though the respective influences of heredity, environment, and language have not been definitely isolated or evaluated conclusively, the results of studies in this field reveal that each of the three factors must be reckoned with if a true and comprehensive presentation of test results is sought.

Studies conducted with Indians, (19) with Orientals, (25) with Negroes, (14) with Latins, (40) and with mixed groups (4) have been offered as indicative of the superiority of Germanic heredity and of the validity of 'intelligence' tests in

the measurement of inherent capacity. Other studies, such as those conducted with foster children, (9) with Negroes and Indians, (20) with siblings and unrelated children, (30) and with nursery-school children, (2) raise serious questions as to this validity and leave open the question of group differences to an interpretation on the basis of environment. Over and above the environmental aspects represented by socio-economic status, schooling, cultural background, etc., is the question raised by studies of bilingual children. The inferiority of bilinguals to monoglots shown in the majority of studies has been analyzed in investigations with Chinese, (37) Japanese, (39) Welsh, (27) Spanish-Americans, (21) French, (3) and with Italians (5). These studies indicate that a foreign home-language is a serious handicap which involves not only an inability to use with efficiency the school language but in some instances it has been suggested also that bilingualism is responsible for a mental confusion which hinders the expression of possible innate ability.

Stated briefly and separated arbitrarily, the three explanations offered to account for group differences are:

a. Innate capacity is differentiated racially, and intelligence tests measure such differentiation.
b. Environment (in its broadest sense) is largely responsible for 'intelligence' as measured by tests. It at least conditions innate ability, and intelligence tests are in part measures of environmental effects.
c. Bilingualism, over and above its environmental attributes, is a handicap acting not only upon language expression and language understanding but upon more intricate psychological processes. At the very least it presents an extra obstacle in the learning process of foreign-language children.

These explanations have led students of the problem to recognize that the scientific value of test results is not entirely determined by the reliability of the measure used but is conditioned by the extent to which the complex factors of hered-

ity, environment, and language, individually and collectively, have entered into the program. How far do studies of Spanish-speaking children reflect this three-sided notion of the fundamental causes of inferior or unusual test results?

First of all it need only be mentioned that, because of Latin extraction and (or) of a varying degree of mixture of Indian with Spanish blood, some students believe that these children are racially inferior to English-speaking American children. Of more significance as a factor to be considered is the undisputed fact that Spanish-speaking children have a vastly different environmental background (easily inferior in its socio-economic and educational aspects) from that of English-speaking Americans. Added to this important and well recognized aspect of the problem is the fact that these children are predominantly bilingual.

Reference to Manuel's (24) scientific evaluation of the educational problem in Texas confirms the evaluation set forth above. Studies by Taylor (35) on labor conditions, by Knox (22) on economic status, by Gonzales (14) on the family, by Smith (33) on nutrition, and by Arnold (1) on customs further illustrate this view and lend added weight to the assumption of both language and environmental differences. Though all of these studies were conducted in Texas, the applicability of the basic findings to Spanish-speaking children in the Southwest is general. This is borne out by similar studies elsewhere and by the opinions of competent educators.

Table I presents a general view of studies in this field. In nearly all of these studies Spanish-speaking children have been found to test lower than English-speaking American children. In the last three columns of the table an attempt has been made to indicate the interpretation, expressed or implied in the studies, of the cause or causes for this inferiority.

A study of the table reveals that there are several investigators who hold to the belief in racial limitations. Garretson, (10) unable to detect serious language difficulties above

TABLE I

Studies of Test Results of Spanish-speaking Children

STUDENT	DATE	MEASURE	CASES*	PLACE	INTERPRETATION**		
					Her.	Env.	Lang.
Davenport (6)	1931	Goodenough	420 *Ss* sibs 126 Es sibs	Texas "		×	
Delmet (7)	1930	Det. Kdgtn. Pint. Cun. Pres. Prim. Haggerty In. Otis Grp. Stfd. Ach.	341 *Ss*	Calif.		?	
Fickinger (8)	1930	Pint. Cun. (Eng. & trs.)	95 *Ss*	N. Mex.			×
Garretson	1928	N. I. T. Pantomime Pint. Cun.	117 *Ss* 197 Es	Ariz. "	×		×
Garth (11)	1923	N. I. T.	307 *Ss* 634 Ind.	Texas Okla. & N. M.	×		
Garth (12)	1928	N. I. T.	1006 *Ss*	Texas, N. M. & Colo.	×	?	
Goodenough (16)	1928	Goodenough	367 *Ss* 500 Es 1590 others	Calif. La., & Tenn.	×		
Haught (17)	1929	Pint. Cun. N. I. T. German grp.	All *Ss* in 4(?) scho. systems	N. M.	?		
Hughes (18)	1928	Goodenough	440 *Ss* 396 Es	Texas "		?	
Knight (21)	1931	Eye-movement (Read.)	21 *Ss* Controls Es	Texas "			×
Koch & Simmons (23)	1928	Pant. & 1 of N. I. T., Det. 1st Gr., or Pint. Cun.	1492 *Ss* 1211 Es 613 Neg.	Texas " "		?	?
Paschal & Sullivan (26)	1925	Perf. Tests Anthro. Meas.	415 *Ss*	Ariz.	×		
Sanchez (28)	1931	Stfd. Ach. Haggerty In.	45 *Ss*	N. Mex.		×	×

TABLE I (*Continued*)

STUDENT	DATE	MEASURE	CASES*	PLACE	INTERPRETATION**		
					Her.	Env.	Lang.
Sheldon (29)	1924	Stfd. Binet	100 *Ss*	N. Mex.	×		?
			100 Es	"			
Sininger (31)	1930	Mon. S. Read.	3336 *Ss*	N. Mex.		?	?
			6563 Es	"			
Stoltz (34)	1931	Meier-Seashore	82 *Ss*	Texas			
		McAdory	103 Es	"			
Tireman (36)	1929	Mon. S. Read.	3366 *Ss*	N. Mex.			
			6119 Es	"		×	
Wright & Manuel (38)	1929	Stfd. Read. (Eng. & Trs.)	128 *Ss*	Texas			×
			450 Es	"			
Young (40)	1922	Army Alpha	51 *Ss*	Calif.	×		
		Army Beta	402 Es	"			
			325 others	"			

* *Ss*—Spanish-speaking, Es—English-speaking.

** × indicates the apparent interpretation (expressed or implied), ? indicates a possible interpretation (expressed or implied).

the second grade through the use of both verbal and non-verbal tests, attributes the low scores to mental inferiority. Garth (11) bases his belief upon the fact that scores on the National Intelligence Test increase with increases in the amount of white blood in Indian veins. In another study (12) he notes a possible response to school training, but again the extremely low standing of Spanish-speaking children seems to be attributed to inherent inferiority. Garth's recent book (13), however, takes cognizance of the doubtful validity of test results in evaluating these children. Goodenough, (16) in the belief that her test is entirely non-verbal, sees no linguistic influences and implies hereditary ones. Haught, (17) finding no increase in IQ's with progress in the grades, does not believe in a language difficulty. He assumes that if such a handicap existed it would be reduced, and the IQ's increased, as the children progress in the grades. This attitude fails to take into consideration that, though the language

difficulty may be reduced considerably by progress in the grades, the handicap may still exist and might become even greater because of the progressively greater amount of language required in each succeeding grade or stage. Paschal and Sullivan (26) find much evidence which points to influences other than racial inferiority but, believing that performance tests are entirely free from language handicaps and that these tests combined (and in agreement) with anthropometric measurements are of unusual value, hold to an explanation on the basis of mental inferiority. Sheldon (29) implies hereditary limitations in his comparison of scores, though his attempt to eliminate language difficulties by a crude translation of the test suggests a slightly different possible view. Stolz (34) in her study of art judgment finds little indication of the alleged artistic superiority of Spanish-speaking children. Young (40) stresses the relative unimportance of language handicaps and finds racial differences in favor of North Europeans on the basis of verbal and nonverbal intelligence tests.

On the environmental side we find little scientific analysis of the influence of environment on test results. Usually investigators have been content to make a rough estimate of living conditions of the subjects under consideration and then to suggest a possible relationship between low socio-economic status and the low scores on the tests. Davenport's (6) results indicate that the older Spanish-speaking siblings show higher scores than would be expected from a comparison with English-speaking siblings of about the same age and grade. Delmet (7) investigated and called attention to differences in environment and in health equipment between the children he tested and normal children. Hughes (18) notes a possible response to schooling in the better scores of upper-grade children. As an illustration of the environmental handicap, Sanchez (28) shows that school training improves quotient scores in all abilities. Sininger (31) advocates an enriched curriculum for the elimination of difficulties in reading.

Tireman (36) explains the deficiencies in his subjects partly on the basis of environment.

The language factor has received the attention of several students. Garretson (10) observed language difficulties below the third grade, while Delmet, (7) Davenport, (6) and Sheldon (29) felt the need of using Spanish in parts of their testing programs. Koch and Simmons (23) find that verbal test scores are lower than non-verbal ones for these children and that city children do better than rural children. Other students have made mention of language difficulties, but it is only in such studies as those of Fickinger, (8) of Knight, (21) of Sanchez, (28) and of Wright and Manuel (38) that an attempt has been made to measure this aspect in some manner.

Fickinger, (8) applying a test both in English and in Spanish translation, observes that the need for translated tests increases as the opportunity to learn English decreases. Knight, (21) making use of the eye-movement technique, finds evidence of some specific reading difficulties resulting from a language handicap. Sanchez, (28) by repeated tests at wide intervals, indicates that improvement in language ability is closely associated with improvement in IQ's and EQ's. Wright and Manuel, (38) using a test in English and in translation, suggest a possible 'dual language handicap.' This latter study is especially significant in view of similar findings for Welsh children in Wales (27) (32).

In general it may be said that differences attributed to heredity because of the partial or even total elimination of language in 'non-verbal' tests may be seriously questioned in the light of Klineberg's (20) findings for Indians, Negroes, and Whites and on the grounds of 'mental confusion.' Lack of comprehensive studies of the influence of environment on test scores of Spanish-speaking children makes it difficult to establish its importance in the problem. Nevertheless, the findings for other groups are a valuable guide which must be followed until it has been shown that the inferior environment of Spanish-speaking children does not affect their test

scores as similar conditions have influenced the scores of other groups. Students of the linguistic difficulties of these children have been handicapped by difficulties in measurement. Translated tests, at best but of doubtful value because of questionable equivalence to the originals, have rendered useful service but can be questioned further on the basis of cultural background. When used as actual measures rather than as experimental tools they may be still further questioned as to their value in revealing the mental confusion resulting from a 'dual language handicap.'

From the foregoing discussion it is apparent that in the education of Spanish-speaking children we have a combination of practically all of the factors which among other groups have been shown to impair the value of test results. Without minimizing the value of the studies of the test scores made by Spanish-speaking children, an analysis of procedures, materials, conclusions, and interpretations, however, indicates that in many instances far-reaching suggestions or interpretations have been made without due consideration of this fact—that the problem of the Spanish-speaking child represents but a sampling of the wider problem of group differences, and that findings in the wider field are inexorably bound up with those for this sampling. Proper accounting for the inferior test results of Spanish-speaking children cannot be made unless it is in terms of the findings for the field in general, for the fundamental causes to which this inferiority may be attributed are not unique or peculiar to Spanish-speaking children but represent influences active upon all.

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SEX DIFFERENCES IN THE MENTAL FUNCTIONING OF SCHOOL CHILDREN

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THE PROBLEM

This study is undertaken to ascertain whether there is evidence of differences in mental traits of boys and girls in elementary grades of the public schools.

The problem presenting itself is a comparison of the sexes in grades 4 to 8 inclusive. The mental traits in question are measured by reactions to certain concrete situations indicative of a manual-mindedness and by reactions to verbal or abstract situations indicative of a verbal-mindedness.

It is important to discover whether during the period of growth there are differences between boys and girls in particular mental functions or abilities measurable by psychological tests, because, to quote Yerkes and Bridges, "At certain ages serious injustice will be done individuals by evaluating their scores in the light of norms which do not take account of sex differences."[1] Though boys and girls average about the same year by year on the Binet and on other tests "calling for quick, accurate work, girls have on the average slightly surpassed boys of the same age, but this may result from the fact that girls mature earlier than boys; they reach adult height earlier and perhaps also adult intelligence."[2]

Differences in mental traits found at early age levels may be indicative of earlier maturing of the sex that is ahead. Studies of special abilities under carefully controlled conditions should reveal whether rate of maturing regulates capac-

[1] Terman, L. M., *The Measurement of Intelligence*, quoting, p. 70.

[2] Woodworth, R. S., PSYCHOLOGY, p. 281.

ity to react to various situations. The questions also arise, whether certain traits are sex determined, that is, due to original nature or whether they are due to training—social environment. Not to fathom this problem but to seek possible sex differences is the aim of this study.

An investigation of the possibility of differences in mental traits between boys and girls is important in the educational field, in connection with the curriculum and training of children along the lines of their special abilities and disabilities; in the field of clinical psychology in evaluating aptitudes and developing them for the best adjustment of the individual; and above all in the field of vocational guidance, for economic independence.

HISTORICAL STATUS

The subject of the relative efficiency of the sexes naturally lends itself to partisan opinion. Text-books of psychology generally concede that there is very little evidence of any significant difference in general intelligence between the sexes, that sex can account for only a very small fraction of human mental differences and that the most important characteristic of these differences is their small amount.[3]

However, some studies have found sex differences even in general intelligence. Whipple[4] reports a higher median score for 1,127 girls than for 1,071 boys, aged 8 to 13 years, in small Western cities, examined by the National Intelligence Scale A and also for nearly 2,500 children examined by the Illinois General Intelligence Test. "The sex differences at the median amount to 9 points. Since at this age the yearly increment of score is 15 units, it follows that the median eleven-year-old girl attains a score in the National Intelligence Test which indicates a grade of mental maturity approximately seven months in advance of the boys of the same age." On the other hand he found High School boys ahead of the girls

[3] E. L. Thorndike, *Educational Psychology*, Vol. III, p. 184.

[4] G. M. Whipple, *J. Ed. Res.*, 1927, 15 pp. 111–117, Sex Differences in Intelligence Tests.

on the Army Alpha. It is generally conceded, however, that interest and social development of boys give them an advantage on this test.

Cummins[5] corroborates findings of sex differences on examining 600 school children 9 to 14 years of age, in grades 3 to 12. The girls at every age scored higher on the average on the McCall Multi-mental Scale than the boys. In the 5th grade boys rated superior to girls on the National Intelligence Test, also in arithmetic, nature-study, history and literature sections of the Stanford Achievement Test. The boys showed greater variability than the girls.

F. G. Bonser[6] likewise found a marked superiority of girls on standard tests of school achievement in grades 4, 5, and 6, though the boys were markedly superior with mathematical reasoning and history. He added that girls are competing with older boys throughout school and if results were worked out on an age instead of a grade basis, the differences would be still greater. These results he concluded are attributable to a more rapid development of the girls.

Terman[7] found the average intelligence of women and girls as high as that of men and boys. However on analyzing his 1,000 IQ's of boys and girls, the girls were found to be slightly but fairly consistently superior up to 14 years when they drop below the boys. It should be pointed out that the difference is only two or three points in terms of IQ and for practical purposes, negligible, though Terman found the difference corroborated by teachers' estimates of intelligence and school work. On examining the results of the individual tests, Terman found marked differences between boys and girls on a few items. The boys were superior in arithmetical reasoning, giving differences between a president and a king, solving the form board, making change, reversing hands of clock, finding similarities, solving the induction test,—the girls

[5] H. Cummins, *School and Soc.*, 1928, pp. 599–600. More About Sex Differences.

[6] F. G. Bonser, *Reasoning Ability of Children*, Columbia Contributions to Education, No. 37, Teachers College, N. Y., 1910.

[7] L. M. Terman, *op. cit.*, pp. 68–72.

in drawing designs from memory, aesthetic comparison, comparing objects from memory, answering the "comprehension questions," repeating digits and sentences, tying a bow-knot and rhyming.

Dearborn and Lincoln[8] report no significant differences in results of the usual intelligence tests as a whole though on separate items large sex differences appear.

Pressey[9] likewise found that the sexes vary according to the nature of the test, but differences follow no general law and are generally small, and therefore they are deemed negligible. Winsor[10] concludes similarly. Goodenough finds mental differences between the sexes very small in comparison with variability between members of the same sex.

Thorndike[11] has collected some data on sex differences based on laboratory experiments and school marks. He found that women excel in the laboratory in color naming tests, card sorting, cancellation tests, spelling, immediate memory, sensory threshold and in school marks in English and French languages. Men excel in reaction time, speed of movement, (finger and arm), accuracy of movement, (arm), ingenuity and in school marks in history, physics and chemistry. Whether these differences are really innate is still unproven.

Differences in specific abilities of the type with which this study deals have been found by other investigators, though there is not always agreement in the results.

Dewey, Child and Ruml[12] examined 375 children with the Binet and various performance tests and found no difference

[8] W. F. Dearborn and Ed. Lincoln, How the Dearborn Intelligence Examination Standards were Obtained, *J. Ed. Psych.*, 22, May, 1922. p. 43.

[9] L. W. Pressey, Sex Differences shown on a Group Scale of Intelligence with Special Reference to Variability, *J. Appl. Psych.*, 2, 1918, pp. 323–340.

[10] A. L. Winsor, The Relative Variability of Boys and Girls, *J. Educ. Psychol.*, 18, 1927, pp. 327–340.

[11] E. Thorndike, Educational Psychology, Briefer Course, pp. 340–354 and 369–376.

[12] E. Dewey, Child and Ruml, *Methods and Results of Testing School Children*, p. 119.

in general intelligence though a distinct sex difference appeared in several items. The boys were ahead on the picture completion test, identification of forms, etc., and the girls in memory for objects, narrative pictures, card sorting time and slightly in Knox cubes. No difference was found in the substitution, cancellation, digits and a few other tests. They conclude that each sex should be judged by its own norms where large differences do exist.

Snoddy and Hyde[13] made a survey of school children in Utah schools using an adaptation of the Army Beta and since the mental elements required in the tests vary considerably from test to test, they analyzed the scale for sex differences which were found to be so large as to be "almost unbelievable." The boys of all ages were far superior to the girls with the maze and cube analysis and the girls far superior in the X–O series and number checking. On the other tests and in the total scores for each age group, sex differences were slight and variable from age to age.

PROCEDURE

Psychological tests[14] of 261 boys and 200 girls in grades 4 to 8 in public schools in New York City and villages in Northern Westchester County, are analyzed to ascertain if there are sex differences in mental traits. Since whole classes were examined, even though the children were for the most part 9 to 14 years of age a very few over 14 and under 9 were included. Not all children had all three tests for one cause or another.

A verbal test, the Otis Intermediate Group Test, Form A, for grades 4 to 8 was administered to 198 girls and 219 boys.

Two non-language tests were used individually. The Army Beta Test was given[15] to 200 girls and 236 boys as an indi-

[13] G. Snoddy and G. Hyde, *Mental Survey of Utah Schools*, p. 23.

[14] Administered and scored by the writer.

[15] As employed in the laboratory of Dr. F. G. Wells, Boston Psychopathic Hospital, Boston, Mass.

vidual test, which necessitated some slight change of procedure, though pantomimed exactly according to the Army directions.[16] The demonstration tests were mimeographed instead of being shown on a blackboard as in the Army and the experimenter performed the first item of each practice series on paper instead of on a blackboard and then allowed the child to perform the other demonstration tests on the practice sheet. The six items of the Beta Test are the maze, cube analysis, X–O series, digit symbol, number checking, picture completion, geometrical construction.

The Army Individual Performance Test,[17] short scale, consisting of six items, the designs, manikin and feature-profile, maze, cube imitation and ship tests were administered to 200 girls and 261 boys. The digit symbol test though not readministered, was scored (for reasons irrelevant to this study) as a seventh test with this series since the instructions for administering may be the same as on the Army Beta.

METHOD

The boys and girls are compared in several ways. All boys are compared with all girls irrespective of age, on each of the three scales, to ascertain the relative standing of the sexes on the tests *in toto*. IQ's were computed for each child after transmuting raw scores into mental ages by interpolations from the tables of norms of the various scales. With the Performance scale the raw scores were first changed to weighted scores[18] then transmuted to mental ages.

To compare the groups in central tendency the short method was used[19] and the following formulas:

$$\text{Av.} = \text{GA plus C (algebraic)}$$

$$\text{C} = \frac{\text{sum FD (algebraic)}}{\text{N}} \times \text{length of step}$$

[16] Yoakum and Yerkes, *Army Mental Tests*, p. 31.

[17] Yoakum and Yerkes, *op. cit.*, p. 126.

[18] *Ibid.*, p. 125.

[19] H. E. Garrett, *Statistics in Psychology and Education*, p. 51.

For variability the standard deviation was used:[20]

$$\text{Sigma} = \frac{\text{sum } FD^2}{N} - c^2 \times \text{length of step}$$

Reliability of the average or mean in terms of its standard error was computed.[21]

$$\text{Sigma}_{av.} = \frac{\text{Sigma dist.}}{\sqrt{N}}$$

The reliability of the difference between the two averages in terms of the sigma of differences was computed.[22]

$$\text{Sigma}_{diff.} = \sqrt{\text{Sigma}^2 \text{ av. 1 plus Sigma}^2 \text{ av. 2}}$$

And the coefficient of reliability, $\frac{D}{\text{Sigma}_{diff.}}$

Besides comparing all the girls with all the boys irrespective of age, they are compared at each age level on each of the three tests, by mean IQ's and comparative line graphs.

The group of girls are also compared as a whole with the group of boys irrespective of age, on each separate item of the two non-language tests. With the Army Individual Performance the weighted scores are used; with the Beta, the raw scores.

RESULTS

Table I compares the average IQ's for all boys and all girls on each of the three tests. A scrutiny of the table shows that the average IQ, 102.75 per cent for the girls on the Otis Test is negligibly below that of the boys, 103.77 per cent and there is no reliable difference between the sexes on this test for the index of reliability is too small to insure difference.[24] The boys again lead on the Individual Performance Test, 103 per cent to 102 per cent, but the coefficient is only a fourth of what it should be to insure a difference always greater than zero. On the Beta Test the means, 108 per cent and a frac-

[20] *Ibid.*, p. 55.
[21] *Ibid.*, p. 121.
[22] *Op. cit.*, p. 129.
[23] *Op. cit.*, p. 133.
[24] Garrett, *op. cit.*, p. 133.

tion very nearly coincide, with an insignificant difference in favor of the boys.

TABLE I

Comparison of Average IQ's of Boys and Girls

	OTIS TEST		ARMY PERFORMANCE		BETA TEST	
	Girls	Boys	Girls	Boys	Girls	Boys
Number	198	219	200	261	200	236
Average	102.75	103.77	102.32	103.34	108.4	108.685
Sigma dist.	17.38	18.57	15.28	13.75	13.7	13.23
Sigma av.	1.23	1.25	1.08	0.85	0.969	0.869
Difference	1.025		1.02		0.28	
Sigma diff.	1.75		1.37		1.07	
$\frac{D}{\text{Sigma diff.}}$	0.58		0.74		0.06	
Range	55–143	66–168	65–139	65–144	65–141	75–145
Middle 50%	90.58–114.0	89.7–116.0	91–112.5	92.8–112.8	98–117	99–117

The range of the IQ's of the girls on the Otis Test is between 55 per cent and 143 per cent; of the boys between 66 per cent and 168 per cent. The middle 50 per cent of the girls are between 90.58 per cent and 114 per cent; of the boys, between 89.7 per cent and 116 per cent.

On the Army Individual Performance Test the range of IQ's for the girls is between 65 per cent and 139 per cent; for the boys, 65 per cent and 144 per cent. The middle 50 per cent of the girls are between 91 per cent and 112.5 per cent; of the boys, between 92.8 per cent and 112.8 per cent.

On the Beta Test the IQ range for the girls is between 65 per cent and 141 per cent; for the boys, between 75 per cent and 145 per cent. The middle 50 per cent of the girls are between 98 per cent and 117 per cent; of the boys, between 99 per cent and 117 per cent.

In all cases the range for the boys is greater than that for the girls at the upper end, and the latter are apt to be lower at the lower end. The middle 50 per cent of the girls are in general but slightly inferior to the boys.

On the whole, however, no reliable sex difference is found by these tests of general intelligence,—results in accordance with the findings of many other investigators.

TABLE II
Mean IQ's for Boys and Girls Per Age Level

AGE	ARMY PERFORMANCE TEST				BETA TEST				OTIS TEST			
	Girls		Boys		Girls		Boys		Girls		Boys	
	No.	IQ	No.	IQ	No.	IQ	No.	IQ	No.	IQ	No.	IQ
9	24	109.75	36	111.68	24	118.3	27	120.0	24	107.95	25	109.0
10	38	108.3	40	108.0	38	115.5	37	116.5	39	104.0	34	110.0
11	41	103.4	53	106.84	41	111.1	45	111.88	40	102.9	39	110.0
12	26	99.65	51	102.0	26	107.7	45	106.0	25	105.0	42	104.0
13	48	95.4	40	96.0	48	100.6	39	100.0	48	100.0	37	95.5
14	18	90.0	35	96.0	18	98.8	35	101.0	17	94.76	34	94.6

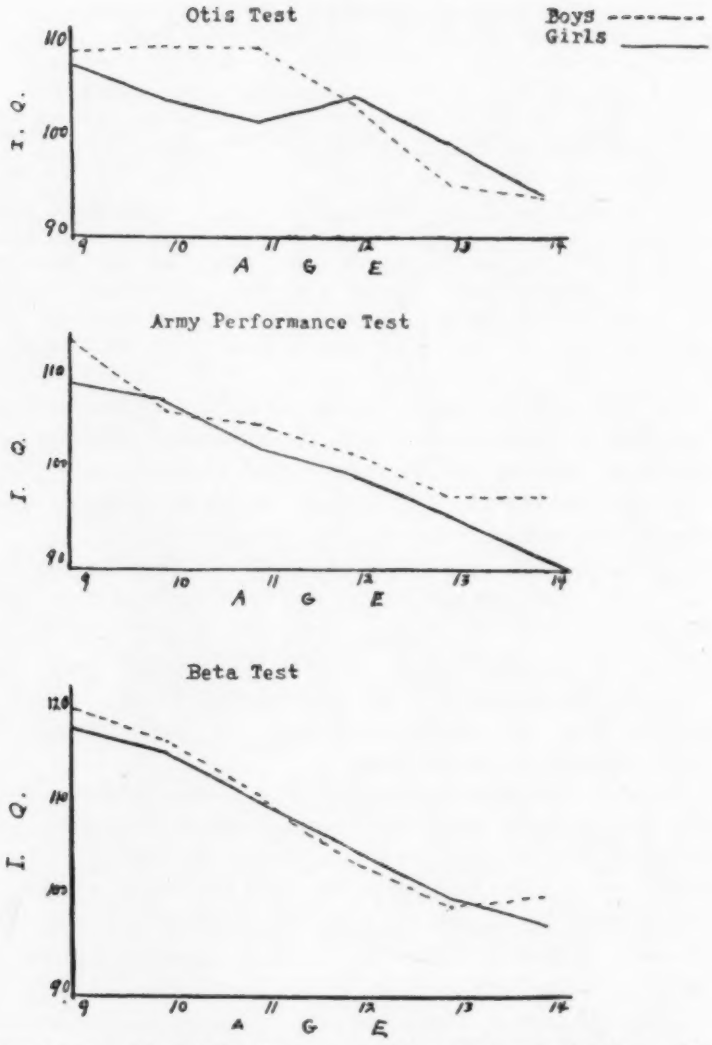
Table II gives the mean IQ's on the three tests for the boys and girls at each age level and the number of children per age level, omitting the few over 14 and under 9 years. The fact that the average IQ's almost invariably decrease with advancing age may be due to the limitations of tests.

Diagrams I, II, and III illustrate the small difference between the sexes per age level. On the Otis Test there is a slight superiority of the boys at 9, 10 and 11 years, of the girls at 12, 13 and 14 years. On the Performance Scale, the boys are slightly superior throughout save at 10 years and on the Beta, the difference though negligible throughout again slightly favors the boys.

Cases are not sufficiently numerous at each age level to permit of statistically valid conclusions, however tendencies are shown which are borne out by the groups as a whole. There is nothing in these findings to bear out the theory of earlier mental maturity of girls, reported by Whipple, Cummins and Bonser. Indeed if either sex shows a superiority however slight, it is the boys.

Table III gives a comparison of the Beta scores for the 200 girls and 236 boys for each separate item of the Beta scale, except the digit symbol test which is shown with the Performance Scale.

The boys are reliably superior to the girls on the maze test, cube analysis, picture completion and geometrical construc-



tion tests. The girls give some evidence of superiority on the number-checking test, though the coefficient of reliability is not quite large enough to insure a reliable difference, and again with the X–O test, though the index is only a little over a third of what it should be to insure a reliable difference.

Table IV gives a comparison of the average weighted scores of the 261 boys and the 200 girls for each item of the Army Individual Performance Test, short scale.

TABLE III

Comparison of Mean Scores of 236 Boys and 200 Girls on Separate Items of Beta Test

	MAZE		CUBE ANALYSIS		X–O		NUMBER CHECKING		PICTURE COMPLETION		GEOMETRICAL CONSTRUCTION	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Average	2.90	3.29	5.12	6.74	8.53	8.19	14.90	13.72	11.18	13.03	3.6	5.12
Sigma dist.	1.03	0.88	2.84	3.11	3.52	2.67	5.71	4.51	3.57	3.70	2.7	2.52
Sig. av.	0.07	0.06	0.20	0.20	0.25	0.17	0.40	0.29	0.25	0.24	0.19	0.16
Diff.	0.387		1.87		0.17		1.18		1.85		1.52	
Sigma diff.	0.693		0.28		0.30		0.50		0.35		0.252	
$\frac{D}{\text{Sigma diff.}}$	4.14		6.58		1.10		2.36		5.32		6.02	

The boys are reliably superior to the girls on the ship test and on the maze test only. They are somewhat superior on the manikin and feature-profile test, with an index nearly two-thirds of what it should be to insure superiority. They are still less superior on the Army designs, and quite negligibly so on the cube test. The superiority of the girls on the digit symbol test is negligible according to the index .52.

The boys lead not only with the Army adaptation of the Porteus mazes in the Individual Performance Test but also with the Beta mazes. Snoddy and Hyde[26] also found boys superior on the Beta mazes. They also found male superiority on the cube analysis test, which is corroborated in this study. Their results showed negligible sex differences with the geometrical construction and the picture completion tests, in which the boys lead in this study. However Dewey, Child and Ruml[27] found boys superior in picture completion as in this study. The girls in this study though showing a tendency to superiority over the boys are not reliably so in number-checking and the X–O tests, on both of which Snoddy and Hyde found them reliably superior.

[26] *Op. cit.*, p. 23.

[27] *Op. cit.*, p. 119.

TABLE IV

Comparison of Mean Scores of 261 Boys and 200 Girls on Separate Items of Individual Performance Test

	SHIP		MANIKIN & FEATURE PROFILE		CUBE IMITATION		DESIGNS		DIGIT SYMBOL		MAZES	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Average	16.62	19.5	15.26	16.40	17.57	18.00	18.38	19.05	21.6	18.85	10.7	12.64
Sig. dist. ...	4.59	5.25	6.32	6.45	6.63	7.35	6.54	6.66	5.75	5.42	6.64	6.4
Sig. av.	0.32	0.32	0.45	0.40	0.47	0.45	0.46	0.41	0.41	0.34	0.47	0.39
Diff.	1.61		1.14		0.44		0.675		2.75		1.93	
Sigma diff.	0.46		0.60		0.65		0.619		0.53		0.61	
$\frac{D}{\text{Sigma diff.}}$	3.50		1.91		0.67		1.09		0.52		3.14	

SUMMARY

The groups of boys and girls compared on the basis of mean IQ's do not differ reliably in general intelligence as measured by these particular scales as a whole,—the Otis Test, the Army Individual Performance Test and the Army Beta Test.

The boys and girls show but a negligible difference in reactions at each age level on the three scales, but when a difference is present it is generally in favor of the boys. There is no evidence of earlier maturing of girls.

There is a reliable difference on specific items of the performance scales, the boys being superior with the mazes, ship, cube analysis, picture completion and geometrical construction. There is an indication of superiority of the girls with the digit symbol, number-checking and X–O tests.

CONCLUSIONS

The findings of this study demonstrate no difference in intelligence generally between boys and girls in school grades or at various periods of growth. There are sex differences, however, in certain specific psycho-motor abilities, that is, in reactions to certain concrete situations. Masculine superiority in manual-mindedness is definitely present in several objective situations. The warning of Yerkes and Bridges not to diagnose on the basis of tests evaluated by norms not taking into account sex differences would be justified by these findings were a limited number of test situations employed.

It is interesting to note that in spite of the superiority of the boys on specific items of the non-language scales the scales are so well constructed, that is, they tap such varied abilities that the differences are equalized on the total scale and the sexes do not differ on the tests as a unit.

The question arises, why these differences in specific abilities? Are they environmentally conditioned, based on opportunity, interest, training,—social attitudes generally? Or are they sex determined, that is, inherent capacities? These questions require further research.

THE TWO-FACTOR THEORY OF ABILITY: REPLY TO DR. R. H. THOULESS AND REJOINDER

HENRY F. ADAMS

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In an extensive study of the rank difference, or order of merit method, I discovered the existence of certain constant relations which, when expressed mathematically, yield formulae identical in form to those advanced by Spearman in connection with his theory of "g" and "s." Any factor or group of factors effective in producing a relatively regular rather than a chance order of phenomena will give results in harmony with the Spearman criterion. For this reason, it appeared that Spearman had committed the logical fallacy of confusing the part with the whole and attributing to the whole the characteristics of the part.

Mental skill applied to a test will (a) rank the individuals taking the test, and (b) will also rank the individual test items in order of difficulty for that group. In both cases the Spearman criteria are satisfied. Similarly, shooting at targets at varying distances will (a) rank the marksman in order of skill and (b) the targets in order of difficulty. In both cases, the Spearman criteria are satisfied. In the same way, natural physical causes may affect the relative amount of rainfall in different regions so that in the long run the various localities have a definite order of wetness. Here are two analogous situations involving (a) the "ability" to precipitate, and (b) the difficulty of precipitating in the different regions. And again the Spearman criteria are found to hold. In golf, the number of strokes taken on each of the 18 holes shows (a) the relative skill of the players and (b) the relative difficulty of the holes. And once more, the Spearman criteria hold.

In brief and speaking only of the rank difference method the Spearman criteria will hold always when two conditions are satisfied. (A) There must be some cause or causes tending to rank the phenomena in the same order time after time, and (b) the errors made in such approximate rankings must be uncorrelated. It would appear then that the Spearman technique has a universal application to all rank difference correlations (and others as well) and is very useful for determining the presence or absence of correlated errors and the identity or difference of standards produced by the cause or causes tending to give definite order or magnitude to the phenomena.

Dr. Thouless has taken me to task for failing to distinguish between the two orders (a) and (b) mentioned above. In the articles criticized, the (b) order, representing the relative amount or quantity or certain physical phenomena used to determine discriminative skill, was employed. He maintains that I should, to make contact with the Spearman theory, have used the (a) order, the one showing the relative skill of the individuals tested.

(1) Dr. Thouless's contention leads me to beleive that he fails to appreciate the logical nature of my argument. If the (a) order only had been used and the results had been in accord with the Spearman demands (and they would have been) the experiment would have been another small unit favorable to the Spearman theory. Since, however, the (b) order of ranks was used, we have deliberately stepped outside of the ground covered, according to Dr. Thouless, by the theory, and we have shown that the theory still holds. It works where it is not supposed to. Instead of revealing a general ability or "g," it discloses the existence of a general or standard order of phenomena constant throughout the experiment. It applies outside of the somewhat restricted limits where it is supposed to apply.

Add to this evidence the work of Thomson, the additional data presented in the papers criticized, and we find that the

criteria exist for determining the amount of "g" when there is no "g" visible in the landscape. Spearman has made the existence of the criterion (c) and the existence of "g" co-extensive, I have shown that the two terms are not co-extensive, but that C is more inclusive than "g." It is proper to say that all "g" is c, but not that all c is "g." And it appears to me that Spearman makes "g" and c identical by saying, that when the correlation table assumes the tetrad form, and only when it does, each measurement included in the table of correlations can be divided into two parts, one a general factor called "g," and the other a specific factor called "s," especially as he subsequently has identified "g" with mental or nervous energy and "s" with the cortical engines.

(2) It might also be wise to try and ascertain just what differences develop from working with the (a) order and the (b) order mentioned above. In the (b) order the test items are kept constant, and the subjects become the variables. The tabulation will show the success of the subject on each and every test item, and, by accumulation, his degree of success on the entire test. It has been shown, when this method is employed, that all mathematical values computed from the rank difference material bear constant relations one to another, so that when one is known all are known, provided that the errors are uncorrelated and the standards identical either in form or in content. Furthermore, each of these mathematical values is a reasonably precise index of the relative difference between the contiguous items to be discriminated. In other words, this method provides a way of measuring relative amount of difference in the discrimination material.

It seems reasonable to suppose that these values are also and simultaneously measurements of the abilities of the subjects to accomplish the particular tasks which they are supposed to do. That a group is more stable than an individual is granted by all. Consequently, we may assume that the ability of the group to discriminate is an approximate constant. This being the case, the result of the application of constant ability to

tasks of varying difficulty will give quite different results, and r_{ax} becomes essentially an index of the difficulty of the material (size of judgment step) rather than a measure of ability. Ability is taken to mean successful completion of an assigned task in terms of a known and accepted standard. Unfortunately, none of the mathematical quantities so far derived from such rank difference material is a true index either of accomplishment or ability. For success in any of the test tasks depends in part upon skill and in part upon chance. The result is that both r_{ax} and r_{ab} are higher than they should be in practically all cases, if they indicate ability.

Now let us consider, as Dr. Thouless suggests, the situation in which the individual is considered as the constant and the test as the variable. The subjects are now arranged in the order of their skill with a group of similar or identical tests. Correlations and deviations are computed. It would appear that now we are dealing with the "ability" of the test to differentiate the individuals who took it and that our result is a measure of the relative differences between individuals in terms of the calibration of the measuring instrument or test. Consequently, Dr. Thouless would have us determine the adequacy of the test for measuring differences of ability, rather than the adequacy of the skill for measuring relative differences of test material.

When both methods (a) and (b) are used and the results plotted one against the other, a smooth curve results, showing that either is a function of the other. In any case, the resulting index is to be considered in the one case as $x + y$, and in the other as $y + x$.

NOTE BY ROBERT H. THOULESS

Professor Adams is certainly mistaken in supposing that Professor Spearman would not agree with his statement that there are wider conditions under which the two-factor criteria will be satisfied—*i.e.*, the presence of a cause tending to rank the phenomena in the same order time after time, while uncorrelated variations in that order prevent its exact repetition. In *The Abilities of Man*, p. 75 n., Spearman says spe-

cifically: "The theorem is quite general: its application is not in the least restricted to psychology." Perhaps Adams has been misled by the fact that Spearman uses the term "g" for the "common factor" in this general case and not only for "general ability." If we use "g" in this wider sense for a common factor, it is not the case that in Adams's results "there is no 'g' visible in the landscape." As Adams has himself observed, the common factor or "g" for his data is the standard order of his test material.

Spearman does not suppose that the common factor revealed by his method of analysis is general ability except in the special case in which the correlations are correlations between abilities. It is true that this condition is not always specifically stated, but only because in the course of a book or article dealing with abilities, such an obvious condition may be left to the understanding of the reader. No one doubts Adams's contention that correlation tables which are not of correlations between abilities may fulfil the "common factor" set of criteria, and that the common factor is then not general ability.

In every particular case in which these criteria are fulfilled, it is necessary to enquire what is this "common factor" or "cause tending to rank the phenomena in the same order." The answer will plainly depend on the nature of the original data. When the original data are test scores of different individuals, Spearman maintains that the common factor is the varying amounts of the individual's "general ability." When the data are orders of test materials, Adams finds the common factor in the standard or correct order of the test material. Both answers are, I think, right, although they are not equally important. The rightness of Adams's conclusions cannot be a reason for supposing that Spearman is wrong.

AUTOMOBILE ACCIDENTS AND THE CITY RAILWAY

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The data of this survey are from a town of 140,000 population located in the middle-west. The city railway has 12 miles of single track. Over this track is operated a maximum of 124 cars at the peak periods of the day, and 65 cars during the dull hours of the day. Each car was manned by a motorman and a conductor. Records and careful estimates show that there are 34,000 automobiles operated on the streets during these same periods.

Since the city is centrally located geographically in a large agricultural district there are on the streets both the city cars, and in addition a large number of out-of-town cars especially during the week-ends, and at other periods while the theater season is on.

The city has automatic traffic signals to regulate traffic. These signals are of standard type and are placed on the four corners of each intersection of the main down-town district and at certain other corners where traffic is heavy.

Streets that enter boulevards have stop signs which require all traffic to stop before entering the boulevard. In the main business district all left turns are prohibited. Many of the main street car lines are on boulevards. It is illegal to pass a street car while passengers are leaving or getting on the car. Most of the streets are wide enough to allow four lanes of traffic to travel easily.

This system of traffic regulations is of as much importance to the city railway as to the automobile traffic, as the system aids the street cars to run at fairly regular intervals.

During the year 1927, for which this survey was made, the railway company spent 2 per cent of its gross earning to set-

tle accident claims. This amount included not only the settlement for automobile and street car accidents but all other accidents as well.

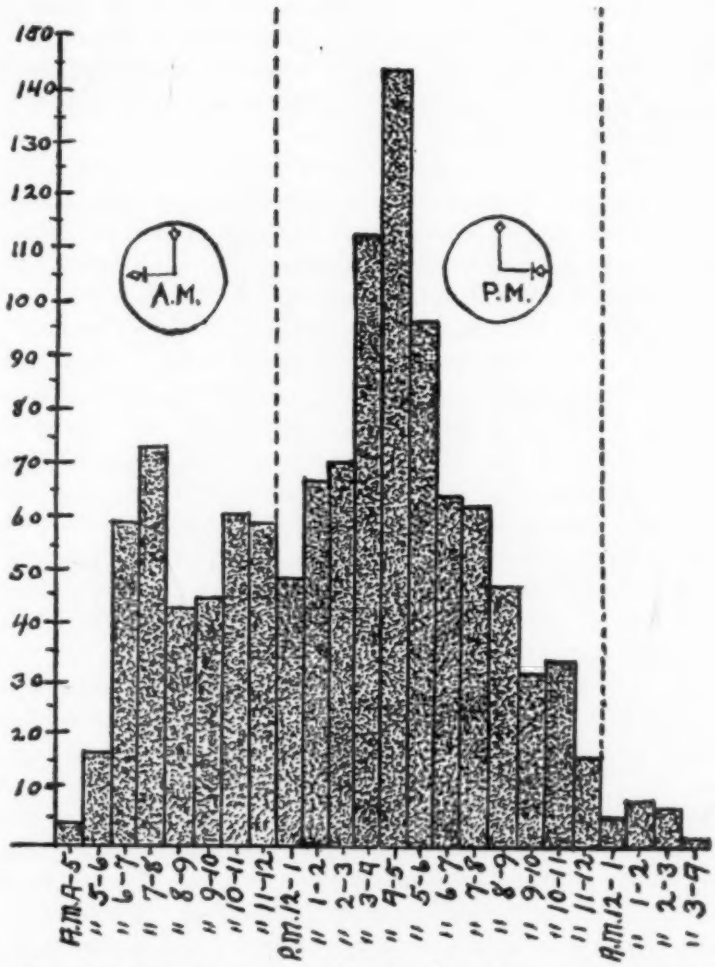
To understand why accidents occur more frequently at certain periods of the day, or year, than at other periods it is necessary to know when the "rush periods" occur. The "rush periods" may be divided into three divisions. The first period is between the hours of seven and nine in the morning when most persons are going to work. The second period is between the hours of four and seven in the evening, and is the worst period for accidents. The third period comes during the show period of the evening. The number of accidents occurring during these periods as well as for the other hours of the day is shown month by month in the table and in the graph. These periods favorable for accidents bear a close relationship to the "proneness to accidents periods" derived from a summary of all the automobile accidents for the entire United States for 1930.*

The most serious accidents to those in the automobiles and the most costly to the railway company occurred during the after midnight hours from one to four. Most of the persons involved in such accidents were drunk and had been attending some "wild-party" during the night.

The street railway company collects all available information regarding all persons involved in each accident. This information shows that those who have the most accidents with the street cars are from the middle working class who are working hard to succeed in their business or work. Whether there is a larger percentage of this class involved is difficult to determine.

Most of the accidents are with people who carry automobile accident insurance. This fact may account for the apparent carelessness of some of the drivers who have had the accidents and suggests a possible lack of confidence in their ability to drive.

* Worse than War, Travelers Insurance Company, Hartford, Conn., 1931, p. 33.



The graph above shows the number of accidents between an automobile and a street car for each hour of the day throughout the year.

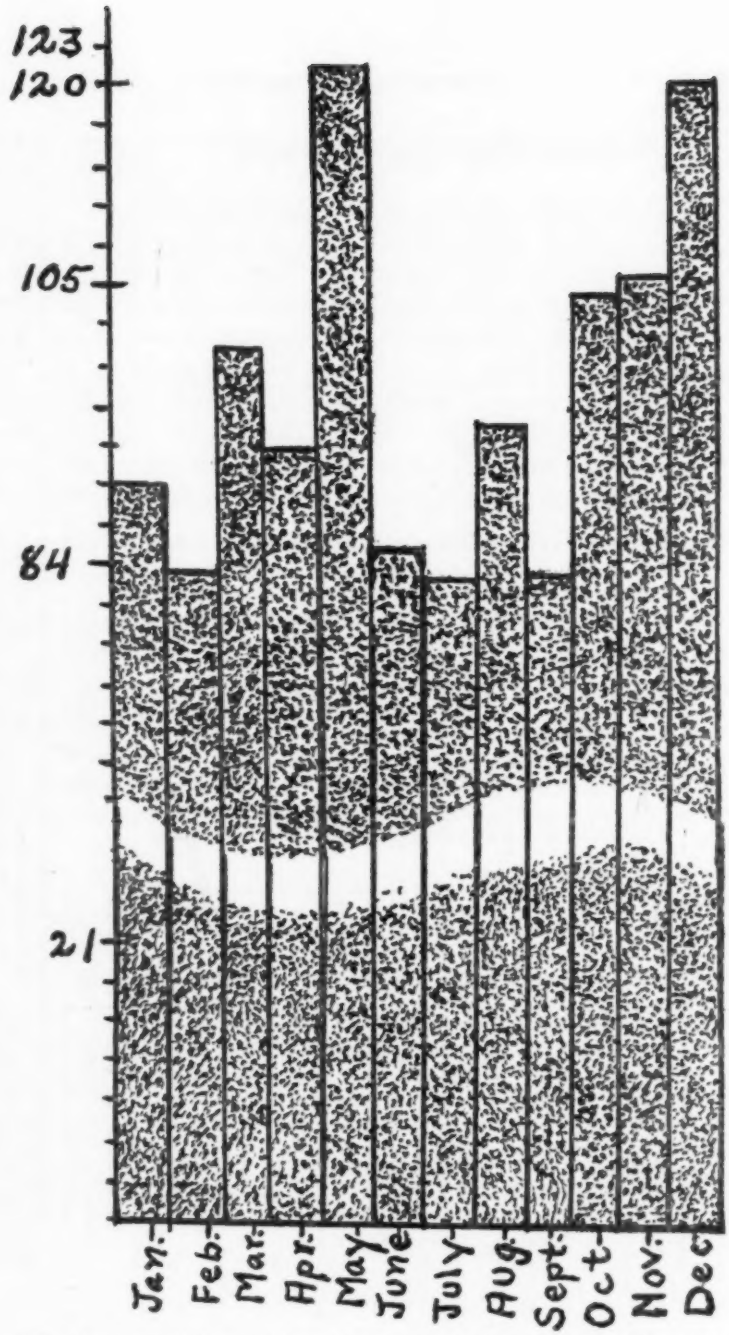
The claim agent has the persons who have had the accidents divided into two divisions on the basis of age. The first group includes the young who range from fifteen to twenty years of age. The second group includes those between the ages of thirty-five and forty-five. Only a relatively small number of men or women beyond forty-five years of age have had automobile accidents with the street cars.

The worst menace on the streets to the street cars is the truck drivers. Most of these drivers are young men. While a few of the largest concerns require their drivers to furnish a bond and to be responsible for accidents, the smaller concerns require no bond of their drivers.

A negligible percent of the taxi-cab drivers have had accidents with the street cars. All the larger taxi-cab companies are careful in selecting drivers. The drivers are educated to drive in traffic. Before they are allowed to drive alone in traffic they must pass strict driving tests while in traffic. The drivers furnish the taxi-cab company with a bond and the drivers pay for all accidents in which they are involved. The drivers must pay all fines for the violation of traffic regulations and in addition are subject to dismissal. While a few accidents are recorded in which a taxi-cab was involved the accidents were all of a minor nature.

Of 1,156 accidents for the year 1927, 50 of these were with cars driven by women. This is 4.4 percent of all the accidents, or one woman driver in an accident to every twenty-two men.

To determine the relative number of women drivers on the streets certain checks were made. Certain intersections which are most representative of the down-town district were picked. These intersections best represented the streets on which incoming automobiles from various directions would be found. The checks were made from 7:00 to 7:30 A. M.; from 11:00 to 12:00 noon; from 5:00 to 5:30 P. M. on three different days. The highest number of cars to pass any one intersection during a thirty-minute period was 680. The



The above graph shows the number of accidents between an automobile and a street car for each month of the year for a given year.

Hour	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
A. M. 4–5	2	0	0	0	1	0	0	0	1	0	0	0	4
5–6	1	0	2	2	2	1	0	1	3	2	2	0	16
6–7	6	7	6	4	5	5	5	5	6	2	4	4	59
7–8	10	6	9	2	5(1)	4	2	6	8(2)	6	4(1)	11	73
8–9	6	5	5	3	3(1)	1	1	3(1)	1	5	4(1)	4	41
9–10	5	2	7	2	2(1)	3	4	7	1	2	5	3	43
10–11	4	3	3	4	6	6	4	6(1)	6	11(1)	1	8	62
M. 11–12	6	4	2	8	4(1)	4	4	4	3(1)	4(1)	6(1)	10	59
P. M. 12–1	2	2	5	7	3	0	4	6	3(2)	4	5(1)	7	48
1–2	3(1)	6	1	4	8	5	5	6(1)	7(1)	6	8(1)	8	67
2–3	6	4	7	6	9	4	3(1)	1	7	6	9	8	70
3–4	9	8(2)	9	7	12	4	9	4	9	13	12	14	110
4–5	9(1)	9(2)	11	10	20	16(1)	5	12	8	10	17	14	141
5–6	6(1)	10	3	9	5(1)	4(1)	8	11	7(2)	11(2)	10(1)	11	95
6–7	2	5	5	8	7	5(1)	3	6	4	9(1)	5	4	63
7–8	2	2(1)	12	2	11	6	5	7	3	4	4	4	62
8–9	5	2	4	4	7	5	6	3(1)	1	3	4	3	47
9–10	3	2	1	4	3	6	5	1	2	1	3	1	32
10–11	2(1)	2	4	2	3	5	4(1)	2	2	4	1	4	35
11–12	1	1	4	2	1	1	0	3	0	0	0	0	13
A. M. 12–1	0	1	0	0	3	0	0	0	0	0	0	0	4
1–2	0	0	0	1	1	0	2	0	0	0	1	1	6
2–3	0	1	0	1	0	0	2	0	0	0	0	1	5
3–4	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	90	83	100	92	121	85	81	94	82	103	105	120	1,156
	(4)	(5)			(6)	(3)	(6)	(6)	(8)	(6)	(6)		(50)

Table showing the number of automobile accidents with a street car for each month at each hour of the day for a period of one year. The numbers in the ( ) indicate the number of women who had accidents. These numbers should be read as: "Of the 5 persons who had accidents in May, from 7 to 8 o'clock A. M., 1 was a woman driver."

counts made showed that one car in six was driven by a woman, or 16.3 percent of the cars.

The records presented here show that women have very few accidents during the morning hours and that most of their accidents come during the "rush hours." Also, the records show that the accidents which women have with street cars are minor accidents, in many cases due to exercising too much care. A check at the Traffic Bureau of the Police Department of this city revealed that only a small percentage of the women drivers are arrested for violating traffic regulations. The three traffic regulations violated most frequently were over-time parking, double parking, and parking in alleys.

SUMMARY

Of 1,156 accidents in which a city street car and an automobile were involved most of them were confined to or peaked into three periods. These periods are 7:00 A.M. to 9:00 A.M., 4:00 P. M. to 7:00 P. M., and 9:00 P. M. to 11:00 P. M. More accidents occurred during the second period than at any other period.

Although the number was small, the most accidents which killed someone occurred during the early morning hours from about 3:00 A. M. to 5:00 A. M.

Only a very small number of taxicabs were involved in the accidents although a large number of taxicabs were always on the streets.

Of the 1,156 accidents 4.4 per cent involved women. An estimate from a count of the cars passing certain points at different periods of the day indicated that 16.3 per cent of the cars on the street were driven by women.

WISHES CONCERNING IMPROBABLE FUTURE EVENTS: REACTIONS TO THE FUTURE

NATHAN ISRAELI

Fellow Social Science Research Council, 1932–33

A line is usually drawn between sound, reasonable wishes and dreamy, Utopian ones. It is quite evident that wishes beyond realization are ordinarily disregarded. It may be interesting to study wishes of college students concerning future events assumed to be improbable. Such a study may throw light upon emotional behavior with respect to time and upon futuristic attitudes. A psychoanalyst might say that this experiment is concerned with basic conflicts between fantastic wishes and reality.

THE EXPERIMENT

This experiment is the concluding part of a preliminary investigation of *reactions to the future* conducted in 1930–1 at the University of Maine. The original purpose of the experiment was to find out the nature of the notions that students have of the term *never* especially in connection with time behavior, and with predictions of future events. The following form was used in the experiment:

Name.....VIII Department.....
(Print your last name first)

A. State three very important things you would like to do this week but which you are most certain that you will *never* do this week.
   1.
   2.
   3.

B. State three most important things that you would like to see happen *on the campus*, but which you are most certain will *never* happen. (On this campus)
   1.
   2.
   3.

C. State three most important things you would like to see adopted by colleges, but which you are most certain they will *never* do.

1.
2.
3.

D. State three most important things you would like to do after graduation, but which you are most certain you will *never* do.

1.
2.
3.

E. State three most important things that you would like to happen in the state of Maine but which you are most certain will *never* happen there.

1.
2.
3.

F. State three most important things that you would like to happen in International Affairs, but which you are most certain will *never* happen.

1.
2.
3.

G. State three most important things you would like to see the United States do about liquor, but which you are most certain will *never* be done.

1.
2.
3.

H. State three most important things you would like to see done in the movies, but which you are most certain will *never* be done.

1.
2.
3.

I. State three most important things you would like to see happen in the industrial world, but which you are most certain will *never* be done.

1.
2.
3.

J. State three most important things you would like to see science do, but which you are most certain will *never* be done.

1.
2.
3.

There were ten different questions. As can be seen from the experiment-form, the subjects were instructed to "state three most important things you would like to see happen . . . but which you are most certain will *never* happen." The subjects were unaware of the purpose of the experiment. No definition of the word *never* was given. There were 126 subjects: two classes of 47 and 44 general psychology students and a class of 35 advanced psychology students.

THE RESULTS

On the whole, the wishes made in this experiment are rather conservative and within bounds. The University of Maine students desired ultimate increase of industrial activity, more urbanism, and less conservatism in the State of Maine.

The three most important things desired by the subjects are listed for each question in the following table, with percentages included:

Table I includes only the three most common reactions for each question. In the first question the three most important things the subjects wished to do *this week* are (1) take a trip (48.4 per cent), (2) write a report (23.8 per cent), and obtain high grades (19.1 per cent).

By combining the percentages for the three most common reactions, the relative convergence of the reactions may be determined for each question. By this method the questions may be arranged in the following decreasing order of convergence of reactions:

(i) International Affairs (+.92)
(ii) After Graduation (+.79)
(iii) This Week (+.49)
(iv) Prohibition (+.72)
(v) State of Maine (+.63)
(vi) Adopted by Colleges (+.30)
(vii) Science (+.50)
(viii) Movies (+.60)
(ix) On the Campus (+.30)
(x) Industrial World (+.47)

The figures in the parentheses at the right of the questions are the average rank order correlation coefficients for the *more* common reactions only of the three different groups of subjects for each question.

SUMMARY

This experiment treats of wishes concerning future events assumed to be improbable. Subjects stated for each one of

TABLE I

QUESTION	PERCENTAGE AGREEMENT	THE THREE MOST COMMON REACTIONS
A—This Week	48.4	Take a trip
	23.8	Write a report
	19.1	Obtain high grades
B—On the Campus	19.9	Smoking privileges for women
	15.9	Construction of swimming pool
	13.5	Equal privileges for men and women
C—Adopted by Colleges	30.2	No finals
	14.3	Minimum tuition
	13.5	Unlimited cutting
D—After Graduation	64.3	Travel
	19.9	Get a desirable position
	19.1	Become rich
E—State of Maine	42.1	Good roads
	18.3	Repeal prohibition
	16.7	Better climate all year round
F—International Affairs	53.2	No wars
	33.3	Complete understanding between nations
	23.8	Common language
G—Prohibition	41.3	Strict enforcement
	32.5	Repeal of 18th Amendment
	15.9	Light wines and beer
H—Movies	18.3	Better pictures
	17.5	More educational movies
	17.5	More realism in movies
I—Industrial World	19.9	No unemployment
	13.5	Better understanding between capital and labor
	9.5	An even or better distribution of wages
J—Science	23.0	Cure for cancer
	19.1	Communication with planets
	11.9	Revival of the dead

ten given situations three most important things which they wanted to see happen but which they were most certain would never happen. For the various groups of subjects, the greatest convergence of opinion was obtained for *International Affairs.* Through a study of Utopian wishes regarded commonly as beyond realization, social and individual time perspective limits may be measured.

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2. ————————. Social psychology of time. Comparative rating and emotional reactions to the past, present, and future. J. Abn. & Soc. Psychol., Sept., 1932.
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NOTES AND NEWS

The attention of our readers is called to the article in this issue by Dr. Harriet Babcock, the title being "The Short Army Performance Scale in Clinical Practice." It is the belief of the author and others that Miss Babcock's article will prove very useful to members of the staffs of psychological clinics. Inquiry concerning reprints may be addressed either to the author, 25 Prospect Place, New York City, or to this Journal.

Garry Cleveland Myers, Head of the Department of Parent Education, Western Reserve University, has become editor-in-chief of *Junior Home for Parent and Child*, succeeding the late Professor M. V. O'Shea. Dr. Myers also writes a syndicated column, "The Parent Problem," which appears daily in about a hundred newspapers throughout the United States.

A recent bulletin of the Federal Office of Education reports an increased enrollment in American high schools of 99.9 per cent between 1920 and 1930. The schools are not only attracting a greater percentage of children of school age to their doors but they are keeping a greater percentage in daily attendance. In 1920 only 75 out of every hundred children were in daily attendance whereas in 1930 there were 82 attending regularly. The elementary school enrollment, however, increased only 10 per cent in the same length of time and the increase in enrollment in first grade was only 3.9 per cent.

The purpose of The Psychological Service Center, 522 Fifth Avenue, New York, conducted under the auspices of The Psychological Corporation, is to "deal helpfully and effectively with many 'normal problems' of normal people." Frequently tests of aptitudes, abilities, personality traits, emotional traits, attitudes and interests, reveal to an individual important facts about himself. The impersonal and unbiased results of such scientific tests contribute greatly toward the proper interpretation of a person's history, practical circumstances, and present problems.

Newton D. Baker, Chairman of the Welfare and Relief Mobilization of 1932, recently made public a report on the hospitals, public health nursing services and tuberculosis in the United States. The Welfare and Relief Mobilization is made up of thirty national social service agencies. Due to

the depression many of the hospitals in the United States may be compelled to discontinue operation. Fifteen per cent of the patients in 1931 could not pay for services rendered. During the same year 110 private hospitals closed their doors.

The California Bureau of Juvenile Research announces the following new staff appointments in the various institutions for the year: Dr. Ruth E. Jaeger, Margaret Ross Noonan, Mrs. Nan M. Allan, Dr. T. W. Hagerty and Mrs. Claire Nordstrom, Pacific Colony; Miss Amytis Richey, Dr. Harry S. Blossom and Mrs. Golda Brinker, Patton State Hospital; Miss Julia Spight, Dr. E. W. Mullen and Mrs. Florence Glenn, Agnews State Hospital; Mr. Alban G. Davies, Dr. Fred J. Conzelman and Mrs. M. L. Hildreth, Stockton State Hospital.

The Federal Office of Education has found that ten cents a day from each person of voting age in the United States would pay the entire bill for public education of almost 26,500,000 pupils and students. The annual cost for publicly controlled education per adult 21 years of age and over in 1930 was $36.42. The total cost was a little over two and a half billion dollars.

BOOK REVIEWS

DODGE, RAYMOND, and KAHN, EUGENE. *The Craving For Superiority.* New Haven: Yale University Press, 1931. Pp. vii–69.

In its eagerness to explain certain types of motivation popular psychology has rather overworked the inferiority complex. Convinced that the total picture of human behavior is much more complicated than Adler's assumption would lead one to believe, Dodge and Kahn have recently discussed superiority and inferiority as intimately related to each other under the following aspects:—

1. Genuine superiority and genuine inferiority as matters of fact.
2. A feeling of superiority and a feeling of inferiority which may or may not correspond to fact.
3. A craving for genuine or matter-of-fact superiority and a craving for inferiority.
4. A craving for the feeling of superiority and a craving for the feeling of inferiority.

The foregoing concepts will be commented upon briefly in the order mentioned above.

1. Most individuals are statistically superior to other persons in some traits and inferior in others. "The chances of an individual's being superior in all human traits are infinitesimal, and the same holds true of his being inferior." p. 2. Therefore, "Each one is both superior and inferior at the same time—superior to those below him and inferior to those above him. Statistics leavs us no alternative." p. 3. Genuine superiority and genuine inferiority are thus matters of fact.

2. *Feelings* of superiority and inferiority may or they may not correspond to genuine superiority and genuine inferiority. Often the feeling in these regards is an accident of the point of view. As was stated by William James years ago, the second-best prize fighter may *feel* much more humiliated about his position than the unambitious average individual since the latter has few or no pretensions and he therefore experiences no sense of frustration. "Our normal feelings of fitness or capacity seldom precisely match the facts." p. 51.

3. The *craving* for genuine superiority is practically universal in human beings, both normal and abnormal, but it differs widely in various individuals both in amount and in the extent to which it modifies behavior. Most men want to excel in a real way in one direction or another, in their professions or in their avocations. This craving for

genuine superiority is a wholesome and useful personal characteristic since it may and often does result in significant achievement.

4. If the craving for genuine superiority be denied it may be replaced by a craving for the *feeling* of superiority. The latter craving may be satisfied by any one of a host of so-called escape mechanisms.

As regards the craving for inferiority and the craving for the feeling of inferiority—the authors insist that these are never real. Individuals sometimes *seem* to seek their own humiliation but this is only an indirect avenue to glory, *e.g.*, one may become "vain" of his own "humility," and one may boast about his misfortunes (the wounded-hero mechanism).

The volume under review is on the whole a calm, succinct, and penetrating synthesis of the psychological and the psychopathological points of view. Of particular interest to psychologists is the fact that the authors find it unnecessary to postulate the inferiority complex as the basis of all (or most) achievement. On the other hand, they find the craving for superiority to be a normal and almost universal human craving. No doubt some of the followers of Alfred Adler will see in this brief treatise the implication that almost everybody has an inferiority complex. Nevertheless the unbiased student will see a vast difference between Adler's illy-balanced point of view and the more reasonable position that is taken by Dodge and Kahn.

HARVEY C. LEHMAN,
Ohio University.

HERSEY, REXFORD B. *Workers' Emotions in Shop and Home.* Philadelphia: University of Pennsylvania Press, 1932. Pp. 441.

This book is an account of a very interesting study of a group of typical normal workmen, in their natural setting, with reference to their emotional life and its relation to their industrial performance. The writer spent a year interviewing each man four times a day. He first observed the worker and tried to estimate his emotional condition from his behavior and then questioned him about it. The workers were informed as to the purpose of the project and cooperated adequately in introspecting on numerous occasions. Data are available on 29 subjects, although many more were studied in less extensive fashion. The subjects were workers in the Pennsylvania Railroad shops.

Part II is the most extensive portion of the work and gives ten exhaustive case studies. Each case is presented in detail followed by a brief tabular summary of the principal emotional factors. The cases were selected to show an instance in which some one factor played the greatest rôle or in which some one kind of individual was involved. The following are some of the individuals described: a thoroughly contented

man; the youngest member of the group with a flair for philandering; one who was strongly motivated by desire for achievement; one with a low IQ but withal normal emotions; a man with an unhappy home life partly due to his wife's extravagance; a disabled worker in a monotonous job and the salutary effect of a change; a case that had difficulty in adapting to a new foreman; a man who controlled his emotions deliberately; one who took life somewhat philosophically and used a good deal of common sense. These case studies will prove very interesting to the clinician. They go into more detail than anything the reviewer has seen in the industrial field and will give a good idea of what we are up against even in approximately normal conditions. One cannot help but wonder what must transpire where there are more serious maladjustments when we find as many ups and downs in the present instance with workers who are not especially maladjusted.

The third part of the book generalizes somewhat on the basis of the individual cases. It is shown how heightened favorable emotions go with increased industrial production. Tabular evidence is given on this point. Generally speaking in periods of increased happiness production is increased 30 to 40 per cent of the time, decreased 10 per cent and unchanged in the remainder of the instances. The emotions appear to be the most frequent concomitants of changes in production but this goes back to more fundamental causes such as work, outside factors, climate and physical conditions. Plant and non-plant factors are about equally frequent in causing fatigue, *i.e.*, the management has direct control of only about half the factors that affect the worker's efficiency. Another interesting finding is evidence for periodic fluctuation in men's emotional state. The cycles are from 4 to 5 weeks. The writer does not commit himself as to the cause.

The chapter on "inferences" is the one that the majority of the readers will peruse most carefully. It presents essentially the things necessary in an ideal plant environment and an ideal extra-plant environment. An interesting feature of the chapter is a "report of a committee of foremen" on each point. The material was used in a foremen's course and the members worked up independently a little report on each major point. These reports agree with the main thesis or supplement it and occasionally take issue. Among the factors in a desirable plant environment are mentioned congenial job, working conditions, security, remuneration, justice, good supervision. Extra-plant factors include cooperation by family, live within income, variety, recreation, satisfactory sex relations.

The appendix gives in more detail the actual technique of interviewing and observing test results and further tabular material for individual workers.

Some readers may be inclined to criticize the whole project on the ground that the technique was largely subjective, involving either the experimenter's inference as to emotions without any laboratory procedure or else the subject's own introspection. The reviewer is inclined to trust to the clinical experience of the writer at least to the extent that his interpretation of workers on one occasion is comparable with his interpretation on other occasions. The reviewer likewise believes that subjects such as those described can be taught to do a modest amount of introspection of the sort called for. Numerous protocols are given and sound as if they had some scientific value.

Personnel workers will find considerable interest in the individual case studies as revealing the kind of emotional situations they will be up against. The academic psychologist will find occasional points of theoretical interest, *e.g.*, affective expansion and mixed feelings. Those who are concerned with improving morale will find the general conclusions of considerable value. The book represents a difficult and careful piece of experimental work and is commended to those interested in the worker's efficiency and happiness.

HAROLD E. BURTT,
Ohio State University.

KAHN, EUGEN. *Psychopathic Personalities.* Translated from German by H. Flanders Dunbar, Yale University Press, 1931.

The author, after calling attention to the limitations of the "purely clinical" observations and descriptions of psychopaths and reviewing briefly the works of Freud, Janet, Adler, Stern, Wexberg and others, then offers his approach to the study of psychopathic personalities. His view-point is influenced by Burnbaum's comprehensive psychobiological approach. Kahn offers the following as the goal to modern psychopathology: "The physico-psychic, stato-dynamic conception of psychopathic personality as a whole." Departing from Kraepelin, who gathered a great mass of psychopathetic material and labelled it according to its most outstanding psychical characteristics, Kahn chooses to collect the results of clinical studies along with their labels and then to choose the label most frequently used or the one at least which seems most convenient. His clinico-descriptive list is similar to yet more inclusive than that of Kurt Schnieder. It differs somewhat from Kretschmer's list.

To use the author's own words, the object of his book is as follows: "We search for the building stones for a constructive consideration of psychopathic personalities." A dynamic longitudinal consideration is demanded, says the author, as well as a static cross sectional consideration.

Concerning the construction of psychopathic personalities the author claims one finds but two ubiquitous groups: (a) The excitable, anxious, moody, etc., or a peculiarity in the realm of affect; (b) the sensitive, compulsive, weak-willed, or a minus in the realm of affect. Three aspects of personality may be considered: namely, intelligence, temperament and character. The author admits the teleological point of view is necessary in psychiatry since, although one may begin with the "impulse-life" ("impulse, an animal urge"), the satisfying of which leads one into the psychical. Temperament rests, for Kahn, on a bodily basis and on impulses but to it are added: "*Fundamental Mood of Life and Emotionality.*" Impulse and temperament are the foundation of character. "Character is the *causa finalis* of personality." Further, *character* steers the personality through the environment.

A normal or concordant personality for the author is a "personality the construction of which is harmonious with respect to body impulses, temperament and character." By a discordant personality is meant a personality whose construction is not so happily harmonized, in which body impulses, temperament and character do not interact without friction." The latter definition fits the psychopathic type of personality. Any quantitative deviations or peculiarities occurring in any one or more of these strata of personality, impulse, temperament and character, constitutes psychopathy.

The author, after devoting the first four chapters of his book to the ground work of constructing psychopathic personalities, considers in chapters 5, 6 and 7 respectively the topics of psychopathic personalities from the view-point of *impulse, temperament* and *character.* He claims "all impulse processes are derived from the fundamental *impulses to self-preservation, self-development* and *preservation of the species.*" Any displacement or quantitative deviation of these fundamental *urges* may constitute the basis of psychopathy. In chapter 6 the middle level of his personality schema, temperament, is laboriously analyzed. Dysthymics is the generic term used to include three groups: *The hyperthymic, the hypothymic* and *the poik ilothymic;* commonly known as vivacious or excitable, phlegmatic or torpid, and labile in mood, in the order given. The author attributes to impulse-life a biological goal but claims temperament *per se* has no goal. However, character shows direction—the direction being either towards personality itself or ego or toward the environment, its non-ego. Although, for Kahn, personality is constructed upon the three levels already mentioned, *personality itself has a goal in that it creates its own values in life adjustment.* In chapter 8 the author treats the causal and final relationships in the psychophysical structure of psychopathic personalities. Since impulse and temperament are rooted in the corporeal the author considers it neces-

sary to treat the physical basis of character. While character has a physical basis the author makes it clear that "*Character is not somatic but completely psychic.*"

After analyzing the structural basis, both physical and psychical, of psychopathic personalities the author then shows how his method of attack may be applied to actual psychopathic cases. The remainder of the book, chapters 8 and 9, is devoted to the kinds of psychopathic personalities found in every-day life and the courses that they take. The following complex psychopathic types are analyzed: *Instability, schizoid types, cold autists, anacastic, sensitive, hysterical, hypochondriacal, quarrelsome, eccentric, asthenic.* The author besides giving representative case material to illustrate the above list of psychopathic types has also given the structural analysis of each type. In closing his book the author, while discussing the course and prognosis of psychopathic personalities, has the following to say about the factors of *heredity* and *environment* as causes: "With all valuation of environmental influences and their final elaborations it cannot be doubted that the essential bases of psychopathic manifestations are given in hereditary endowment." The hope lies not in changing the constitutional structure of psychopathic personalities but in educating them to "understand themselves, to come to terms with themselves and to set themselves a genuine goal which they may reach in spite of their psychopathic peculiarities."

The book, although heavy in style at times in the writer's opinion, is a monumental work in the field of psychiatry and psychopathology. While one may not always understand the author's point of view or be in sympathy with it nevertheless one feels that the writer knows what he is about and is a master of his field.

EURICH, ALVIN C. *Reading Abilities of College Students.* University of Minnesota Press, 1931.

The author, after outlining his problems on reading and study habits, gives a cursory review of the literature in recent years on these topics. This review reveals the fact that of the thirty-one studies reported only eight were adequately controlled. In view of this fact Eurich using college students as subjects attempts adequately controlled studies of the following things: Reading comprehension; retention of material read; speed of reading; vocabulary; reading and study habits. Since there were no tests or battery of tests adequate to measure the problems which he had in mind the first task was to construct reliable measuring scales. Using very refined statistical methods the author, with the help of others, constructs the following scales: *The Minnesota Reading Examination for College Students* and *The Minnesota Reading Examination Xi XIII.* The former measures reading comprehension; the latter re-

tention of material read. The author was able to attain a relatively high reliability for his tests but the validity had to depend, to a great extent, upon the inherent qualities of the tests. Two other tests were made as follows: *The Minnesota Speed of Reading* and a *Vocabulary Test.* A *Studiousness Rating* scale was devised but it proved to be a failure. The author claims that his *Speed of Reading* test has the uniqueness of measuring the rate of reading of seventh grade pupils as consistently as it does college students. The introduction, the review of literature, and the description of constructing the scales and tests constitute the first two parts of the book.

Part III is devoted to the actual experiments conducted on University of Minnesota students during the academic years 1928–29 and 1929–30.

Reading Experiment I was to study the effect that drills in vocabulary, paragraph reading, and study have upon reading efficiency, vocabulary, marks in English, and marks in all subjects taken by the students. Two groups of subjects, one control, the other experimental (both groups were equated for intelligence), were used. After administering preliminary tests to both groups the experimental group was then subjected to intensive drills during the first ten minutes of class period each day. The drills were on vocabulary, paragraph reading, etc. The control group was allowed to go on with its regular class work. At the end of the experiment both groups were given the final tests. The writer concludes from the results that "no significant differences were found between the trained and untrained groups in paragraph reading, retention in reading, speed of reading, English composition and achievement records." (p. 100). Experiment Ia was a continuation of Experiment I, the purpose of which was to check the question with regard to the influence of length of training. The results of Experiment Ia further support the data obtained in Experiment I.

Experiment II on reading sought to factor out more completely the influence of vocabulary drill on general vocabulary, paragraph reading, speed of reading and scholastic achievement. The groups of subjects used in Experiment II were more representative of the whole freshman class than the previous groups studied. After the initial tests to both groups the experimental group was subjected to intensive drills. Aside from the gain made by the experimental group on the vocabulary part of the college ability test no significant gains on general vocabulary, reading, etc., were found. However, gains were made on the specific words occurring in the test material that had also occurred in the drill material. Further trends, although statistically unreliable, toward gains in the other functions were found. Experiment III was similar to Experiment II in that it attempted to determine the effect of drills

in paragraph reading on comprehension, retention and scholastic proficiency. The subjects used were the same as in Experiment II. The results showed practically no gains.

Experiment IV was designed to answer the question, "Will a program of systematic and relatively intensive vocabulary drills eventuate in a permanent increment in vocabularies of college students?" While the previous experiments took place during the academic year 1928–29, Experiment IV was carried on in 1929–30. With the exception of the training period the procedure in Experiment IV resembled that of the other experiments. This experiment lasted through the three quarters. The results show a definite gain made by the experimental group on both specific and general vocabularies during the first quarter. But during the second quarter (winter quarter) the control group continued in normal growth whereas the experimental group did not. However, the gain over the two quarter period still favored the specially trained group. During the third quarter neither group had drills in vocabulary. By taking the three quarters together the experimental group showed gains over the control group in specific vocabulary but not in other functions measured.

The contribution of these studies, it seems to the reviewer, lies not in the fact that they reveal large positive increments gained over different drill periods in vocabulary, paragraph reading, retention, etc., but in the fact that how little measurable (according to present scales) progress is made during a relatively short period of time. Further, that life's habits of reading, study, vocabulary, etc., are complex and yet rather specific functions and do not lend themselves readily, thus far, to precise measurement. After all, who knows what the ultimate value of these drills, say on vocabulary, may have in giving students a "set" or attitude for precision of words and meanings? Certainly the experimental group did not lose anything from their progress in routine class achievement. Besides constructing refined scales the study should be a model for other studies from a scientific point of view in this field.

JAMES R. PATRICK,
Ohio University.

COWLEY, W. H. *The Personnel Bibliographical Index.* Bureau of Educational Research, Ohio State University, 1932. Pp. VI and 433.

This volume is a genuine contribution to a field of interest which has had almost a mushroom growth. Personnel work has not infrequently suffered from an impatience with the rather slow and on the whole rather undramatic application of scientific methods to bewilderingly complex problems. The present work will be a tool of first importance to the research worker and the administrator.

The primary criterion for evaluating a reference work such as this is the facility with which it enables the user to orient himself with reference to the literature on any given topic. Judged on this basis the volume under review ranks high indeed. The mechanical aspects show evidence of careful and fruitful thought. Part I, the Subject Index, gives in fifty-six pages by topics the numbers of all references listed. The references considered very important have their numbers listed in bold-faced type; those judged of more than usual importance, in italics; and those of ordinary importance, in Roman type. In Part II, The Annotations, all references are listed by number, complete title, with brief annotations, in which the scheme of bold-face, italics, and Roman type is again followed to indicate the relative importance of the reference. Part III, the Authors' Index, however, lists the authors with the numbers of their respective references only in Roman type. The present reviewer would have liked to see the three-point scale of merit carried out here also, since this would have provided a simple means of providing a sort of Who's Who in personnel work with individuals arranged in order of merit.

While the mechanical organization is important, it necessarily derives from the philosophy of the bibliographer. It is with distinct gratification that the reviewer finds himself in almost complete agreement with the author on the assumptions underlying personnel work in general and this bibliographical index in particular. Dr. Cowley lists five basic assumptions: (1) Student personnel is not analogous to industrial personnel in that it is centered around the individual student rather than around production of goods and services; (2) personnel administration is one of four main divisions of university administration, *i.e.*, operational, instructional, research, and personnel administration; (3) personnel administration is the administration of all student relationships *aside* from formal instruction; (4) personnel administration is ideally a situation in which every teacher is essentially a personnel officer, with certain functions reserved to personnel administration; (5) student personnel administration divides itself logically into individualized services, administrative services, personnel research, and co-operative research services. It is only with the third one of these assumptions that I should wish to raise any issue. The implication here is somewhat too much that of education of the individual in separate compartments. Formal instruction, like any other educational influence, must contribute to the total integration of the individual and should serve as a mechanism to that end. It is, therefore, a part of any complete personnel program.

One paragraph of the Introduction so closely accords with the judgment and professional work of this reviewer that he cannot resist the

temptation to quote it in substance. ". . . Instructional research of this type [instructional methodology] should be conducted by a research department charged with the investigation and improvement of instructional methods. Almost all American universities and colleges have neglected any concentrated attack upon these problems, but it is inevitable research in instructional methodology will in time be given the emphasis it deserves."

H. H. REMMERS,
Purdue University.

V. E. FISHER. *An Introduction to Abnormal Psychology.* The Macmillan Co., New York. 1929. x + 512 pp.

FRED. A. MOSS and THELMA HUNT. *Foundations of Abnormal Psychology.* Prentice-Hall, Inc., New York. 1932. xii + 548 pp.

RICHARD J. A. BERRY and R. G. GORDON. *The Mental Defective, A Problem in Social Inefficiency.* Whittlesey House, New York. 1931. xiii + 225 pp.

W. M. KRANEFELDT. *Secret Ways of the Mind. A Survey of the Psychological Principles of Freud, Adler, and Jung.* Translated with a preface by Ralph M. Eaton. Henry Holt & Co., New York. 1932. xl + 188 pp.

Of these four books Fisher's *Introduction* is probably the most important as a treatment of abnormal psychology. He recognizes the effects of organic pathology on behavior but considers that "mental abnormalities can be most adequately understood and dealt with when viewed as disorders of the personality." The personality is defined as "the expression of the integration of the sum total of the individual's mental aspects." Following the first four orienting chapters the author considers "some common modes of reaction to difficulties"—trial and error, compensation, inhibition, dissociation, etc. In the next three chapters he describes the psychoneuroses; the psychoses in Chapters XII to XIV; then sleeping, dreaming, hypnosis, and the feebleminded. The organization of this material is excellent and the discussion is clear with many case illustrations.

Although the author uses the term mental almost too frequently yet the general trend of his discussion makes one wonder if he could not have written the book equally well without the concept. Another possibility is that in using this term he does not consider it as the mystical half of the mind-body dichotomy. His emphasis on the part played by training, environment and experience on the development of personality, and his questioning attitude toward the view that mental disorders are inherited would, to the reviewer at least, support the preceding statement. The book appears to be extremely useful for text-book use.

The *Foundations* of Moss and Hunt which also purports to treat of abnormal psychology is so extremely colored by the thesis that "the mind is merely the result and accompaniment of the functioning of the body as a whole, and its integrity depends upon the integrity of the bodily structures on which it is based" that one questions if it can properly be called a psychology at all. Chapters XII to XIX consider specific disorders due to bacterial infections, toxins, glandular disturbances, neural pathology, and traumas, while Chapter XX considers those disorders whose causes are only partially known, *viz.*, epilepsy, dementia praecox, manic-depressive psychoses and neurasthenia. The last chapter is devoted to those disorders the causes of which are unknown (at least organic causes), *viz.*, paranoia, hysteria and psychasthenia. Throughout the discussion one wonders if this material doesn't belong to clinical neurology or clinical psychiatry rather than to psychology. Psychologically it is the disorders they treat summarily in the last chapters as those the causes of which are relatively unknown that offer most of interest.

In addition to Part II, a consideration of specific diseases, the first part of this book presents general data on the history, symptoms, causes, treatment and prevention of mental disorders. These, together with the description of disorders which are psychologically of lesser importance, constitute a useful contribution. A psychologist could hardly use this book as a text, although it would make a good supplement to Fisher's *Introduction* which omits any account of disorders due to organic influences.

"Mental deficiency is a partial or complete premature arrest of brain growth and development, especially of the minute cells of the brain, which occurs either before birth or at some time between birth and the age of puberty." Thus Berry and Gordon in the *Mental Defective* account for all mental deficiency—idiots, imbeciles, and morons, as well as moral imbeciles! They deny that feeblemindedness is primarily a school problem and therefore its determination cannot be made by school authorities. Tests are scarcely mentioned although Binet and Porteus Maze ages are given on several of the illustrations. One wonders if the authors really understand the following statement from the plate facing page 172: "Mental age by Binet and Porteus tests 11.7 years, the respective intelligence quotients being 62 and 84!" They admit that mental deficiency is a grave social problem but they do not offer any definite social criteria of the condition. Rather the cause is an insufficiency of brain cells which insufficiency "can be recognized without difficulty by those trained in the requisite knowledge" and therefore there is "no reason why mistakes in diagnosis should occur." After careful re-reading of the book I have been unable to find any definite

statement as to how the insufficiency of brain cells is to be determined. There is a chapter on elementary neurology and one called "The making of mind" which appears to be a layman's attempt to write an elementary exposition of psychology. Why are such books published? For the specialist in feeblemindedness it is, of course, too elementary; the intelligent layman, if he cares to investigate, will find that it gives a distorted and incomplete picture of the whole problem.

The fourth of these books is a critical and well written summary of the psychoanalytic schools of Freud, Adler and Jung. The author evidently prefers Jung's theoretical position. The translator, Ralph M. Eaton, has contributed a preface in which he says that he wants "to indicate some of the general, philosophical aspects of this new psychology." In essence the argument is that the unconscious is "not a theoretical construct but a fact of human nature" and that occidental civilization "needs to relax its fever of competition and progress and allow * * * the smiling calm and inward poise of the East * * * to emerge from the unconscious." Does this mean anything scientifically? Still, whether the preface adds to the value of the book or not the translation was worth-while. Kranefeldt has adequately and simply presented the views of the three leading psychoanalytic schools. The positions are so well known that there is no need to analyze them here. It is sufficient to say that the book will serve as an extremely useful presentation of the psychoanalytic points of view. It would serve admirably with Moss and Hunt's book as supplementary reading for a class in abnormal psychology using Fisher as a text.

C. M. Louttit,
Indiana University.

NEW BOOKS AND PAMPHLETS RECEIVED

Books and pamphlets for review should be sent to James P. Porter, Editor, JOURNAL OF APPLIED PSYCHOLOGY, Ohio University, Athens, Ohio.

American Social Psychology. FAY B. KARPF. McGraw-Hill Book Company, New York City. $3.50. 461 pp.

The Changing Culture of an Indian Tribe. MARGARET MEAD. Columbia University Press, 1932. $4.50. 313 pp.

Economy and Technique of Learning. W. F. BOOK. D. C. Heath and Company, New York City, 1932. $2.00. 534 pp.

Founding the Psychological Laboratory at the State University of Iowa. GEORGE T. W. PATRICK. Iowa Journal of History and Politics, July, 1932. State Historical Society of Iowa, Iowa City, Iowa. 15 pp.

General Psychology. FLOYD C. DOCKERAY. Prentice-Hall, Inc., New York City, 1932. $3.50. 581 pp.

Health Misconceptions of Prospective Teachers. PAUL RHOTON. Penn State Studies in Education, No. 5. Pennsylvania State College, State College, Pa., 1932. $1.00. 80 pp.

Industrial Psychology. MORRIS VITELES. W. W. Norton & Company, New York City, 1932. 652 pp.

Industrial Psychology in Practice. H. J. WELCH and G. H. MILES. Isaac Pitman and Sons, New York City. $2.50. 249 pp.

Mental Deficiency Due to Birth Injuries. EDGAR A. DOLL, WINTHROPE M. PHELPS and RUTH TAYLOR MELCHER. The Macmillan Company, New York City, 1932. $4.50. 289 pp.

The Personnel Bibliographical Index. W. H. COWLEY. Bureau of Educational Research, Ohio State University, Columbus, Ohio, 1932. 433 pp.

Personnel and Labor Problems in the Packing Industry. ARTHUR H. CARVER. University of Chicago Press, Chicago, Illinois, 1932. 226 pp.

Psychology: Its Methods and Principles. FLEMING ALLEN CLAY PERRIN. Henry Holt and Company, New York, 1932. $2.00. 335 pp.

State Legislation Relating to Kindergartens in Effect 1931. MARY DABNEY DAVIS and WARD W. KEESECKER. Office of Education, Pamphlet No. 30, U. S. Department of Interior, Washington, D. C. 5 cents. 30 pp.

Directory of American Psychological Periodicals

(Continued)

Psychological Abstracts—Eno Hall, Princeton, N. J. American Psychological Association. Subscription $6.00. 700 pages ann. Edited by W. S. Hunter. Monthly. Abstracts of psychological literature. Founded 1927.

Journal of General Psychology—Worcester, Mass.: Clark University Press. Subscription $14.00 per annum; $7.00 per volume. 1000 pages annually (2 volumes). Edited by Carl Murchison and an international cooperating board. Quarterly. Experimental, theoretical, clinical, and historical psychology. Founded 1927.

Journal of Social Psychology—Worcester, Mass.: Clark University Press. Subscription $7.00. 500 pages annually. Edited by John Dewey, Carl Murchison, and an international cooperating board. Quarterly. Political, racial, and differential psychology. Founded 1929.

Personnel Journal—Baltimore: The Williams & Wilkins Co. Subscription $5.00. 500 pages, approximately. Edited by Walter V. Bingham. Bi-Monthly.

Mental Measurement Monographs—Baltimore: The Williams & Wilkins Company. Subscription $5. 400 pages annually. Edited by Knight Dunlap and Buford Johnson. Published without fixed dates, each number a single research. Founded 1925.

Studies in Psychology and Psychiatry—Baltimore: The Williams & Wilkins Company. Subscription $5. 400 pages annually. Edited by Edward A. Pace. Published without fixed dates, each number a single research. Founded 1926.

Journal of Philosophy—New York: 515 West 116th Street. Subscription $4.00. 728 pages per volume. Founded 1904. Bi-weekly. Edited by F. J. E. Woodbridge, Wendell T. Bush, and H. W. Schneider.

Child Development—Baltimore, Md.: Williams & Wilkins Company. Subscription. $5.00. 400 pages annually. Edited by Buford Johnson. Quarterly. Founded 1930.

Directory of American Psychological Periodicals

American Journal of Psychology—Ithaca, N. Y.: Cornell University. Subscription $6.50. 624 pages annually. Edited by M. F. Washburn, K. M. Dallenbach, M. Bentley, E. G. Boring. Quarterly. General and experimental psychology. Founded 1887.

Pedagogical Seminary and Journal of Genetic Psychology—Worcester, Mass.: Clark University Press. Subscription $14.00 per annum; $7.00 per volume. 1000 pages annually (2 volumes). Edited by Carl Murchison and an international cooperating board. Quarterly. Child behavior, animal behavior and comparative psychology. Founded 1891.

Psychological Review—Princeton, N. J.: Psychological Review Company. Subscription $5.50. 540 pages annually. Bi-monthly. General Psychology. Edited by Howard C. Warren. Founded 1894.

Psychological Monographs—Princeton, N. J.: Psychological Review Company. Subscription $6.00 per vol. 500 pp. Ed. by Raymond Dodge. Published without fixed dates, each issue one or more researches. Founded 1895.

Psychological Index—Princeton, N. J.; Psychological Review Company. Subscription $4.00. 300–400 pp. Edited by W. S. Hunter. An annual bibliography of psychological literature. Founded 1895.

Psychological Bulletin—Princeton, N. J.: Psychological Review Company. Subscription $6.00. 720 pages annually. Psychological literature. Monthly. Edited by Edward S. Robinson. Founded 1904.

Archives of Psychology—New York: Columbia University. Subscription $6. 500 pp. ann. Ed. by R. S. Woodworth. Published without fixed dates, each number a single experimental study. Founded 1906.

Journal of Abnormal and Social Psychology—Eno Hall, Princeton, N. J. American Psychological Association. Subscription $5. Foreign, $5.25. Editor, Henry T. Moore. Quarterly. 448 pages annually. Abnormal and Social. Founded 1906.

Psychological Clinic—Philadelphia: Psychological Clinic Press. Subscription $3.00. 288 pages. Ed. by Lightner Witmer. Without fixed dates (9 Numbers). Orthogenics, psychology, hygiene. Founded 1907.

Psychoanalytic Review—Washington, D. C.: 3617 10th St., N. W. Subscription $6. 500 pages annually. Psychoanalysis. Quarterly. Ed. by W. A. White and S. E. Jelliffe. Founded 1913.

Journal of Experimental Psychology—Princeton, N. J. Psychological Review Company. 500 pages annually. Experimental. Subscription $6.00. Bi-monthly. Edited by S. W. Fernberger. Founded 1916.

Journal of Applied Psychology—Lancaster: The Science Press Printing Co. Subscription $5.00. 400 pages annually. Bi-monthly. Edited by James P. Porter, Ohio University, Athens, Ohio. Founded 1917.

Journal of Comparative Psychology—Baltimore: The Williams & Wilkins Co. Subscription $5.00 per volume of 450 pages. Three volumes every two years. Edited by Knight Dunlap and Robert M. Yerkes. Founded 1921.

Comparative Psychology Monographs—Baltimore: Johns Hopkins University Press. Subscription $6. 400 pages per volume. Knight Dunlap, Managing Editor. Published without fixed dates, each number a single research.

Genetic Psychology Monographs—Worcester, Mass.: Clark University Press. Subscription $14.00 per annum; $7.00 per volume. 1000 pages annually (2 volumes). Edited by Carl Murchison and an international cooperating board. Monthly. Each number one complete research. Child behavior, animal behavior, and comparative psychology. Founded 1925.

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